

---

# FREE FALLING

## LIVING STANDARDS DURING TIMES OF CONFLICT IN YEMEN

Decision Review Draft

May 2017

DO NOT QUOTE OR CITE WITHOUT PERMISSION



## Acknowledgements

This report has been prepared by a multi-sectoral team led by Sailesh Tiwari and comprising Sharad Alan Tandon, Hiroki Uematsu, Yeon Soo Kim, Sushant Joshi, Dominique van de Walle, Caitlin Brown, Afrah Al-Ahmadi, Lire Ersado, Wilfried Engelke, and Amir Mokhtar Althibah. The team is grateful to Dean Mitchel Joliffe, Silvia Redaelli, Nobuo Yoshida, Sergio Olivieri, Tara Vishwanath, Valerie Evans, Juan Munoz and other participants of the Quality Enhancement Review (QER) of the core poverty measurement methodology utilized in this report for their comments and suggestions. Peer reviewers Kathleen Beegle, Silvia Redaelli and Ruth Hill provided several comments that helped improved the analysis presented here. Suhair Murad Al-Zubairi, Lanto Ramanankasina and Nelly Obias provided crucial administrative support throughout the development of this product.

The team benefitted from several in depth technical consultations with the staff in the Central Statistics Organization of Yemen. The team is particularly grateful to Ahmed Eshaq (Chairman), Dr. Tareq Alekbasi, Baset Quabati, Tahany Alafifi, and Anwar Farhan for sharing several secondary data sources, providing detailed comments on earlier versions of the analysis and generally being available to provide information on the survey and its context in Yemen.

Finally, the team is also grateful for the overall guidance, support and technical inputs received throughout this process from Benu Bidani (Practice Manager, Poverty and Equity GP), Asad Alam (Country Director, MNCO03) and Sandra Bloemenkamp (Country Manager for Yemen).

## Table of Contents

Acknowledgements.....	2
List of Tables .....	6
List of Figures .....	7
List of Boxes .....	8
Overview .....	9
Chapter 1 : Poverty in Yemen, 2005-2014 .....	14
Poverty trends.....	14
Inequality .....	16
Poverty Profile .....	18
Non-income Dimensions of Wellbeing .....	24
Water and Sanitation .....	24
Floor materials .....	25
Electricity.....	26
Education .....	27
Health.....	28
Chapter 2 : Projecting Poverty in Yemen into 2016.....	31
The Conflict and its Economic Impact.....	31
A Brief History .....	31
The National Dialogue, Residual Resentment and Civil War .....	32
Impact on the Economy .....	32
The Human Cost.....	34
Poverty Projection .....	37
Methodology.....	38
Results.....	41
Validation .....	45
Conclusion.....	48
References .....	49
Annex .....	50
Annex 1 .....	50
Annex 2: Internally Displaced Persons (IDPs) .....	55
Chapter 3 : Food and Nutrition Security in Yemen, 2005-2014.....	58
Introduction .....	58

Access to Food in Yemen, 2014 .....	58
Changes in Consumption between 2005 and 2014 .....	65
Household Resilience in the Face of Shocks .....	68
Conclusion.....	72
References .....	74
Chapter 4 : Social Protection during Times of Conflict .....	76
Introduction .....	76
Poverty and Vulnerability in Yemen .....	77
Overview of Social Protection in Yemen.....	77
Government Subsidies .....	78
Government and Donor Funded Cash Transfers .....	78
Descriptive Statistics .....	79
Incidence of transfers .....	86
Lessons for Social Protection Policy?.....	102
Are the actual beneficiaries of the SWF those intended as the target group? .....	102
Do transfers favor smaller households? .....	105
How well do transfers respond to household shocks? .....	112
Conclusions .....	116
References .....	117
Chapter 5 : A Technical Report on National Poverty Update .....	118
Summary.....	118
Introduction .....	118
Data Description .....	118
Overview of Poverty Measurement.....	119
Consumption Aggregate .....	119
Food Consumption.....	119
Nonfood Consumption.....	123
Spatial Price Adjustments .....	126
Total Consumption and Category Shares.....	127
Poverty Lines.....	128
Minimum Caloric Threshold.....	129
Reference Population .....	129
Nonfood allowance .....	131

Poverty Analysis ..... 132

References ..... 134

Annex ..... 135

    Annex I: Sensitivity Analysis on Food Consumption and Implications of Outlier Treatment on Food  
    Consumption Quantities ..... 135

    Annex II: Sensitivity Analysis on Poverty Lines and Poverty Rates ..... 138

## List of Tables

Table 1.1: Headcount Poverty Rate, the Republic of Yemen.....	14
Table 1.2: Growth and Inequality Poverty Decomposition.....	16
Table 1.3: Inequality Measures 2005/06 and 2014 .....	17
Table 1.4: Inequality Measures 2005/06 and 2014 .....	17
Table 1.5: Governorate Level Poverty Rates and Number of Individuals below Poverty Line, 2014 .....	19
Table 1.6: Household Access to Improved Water, Sufficient and Improved Water, and Improved Sanitation .....	24
Table 1.7: Mud and Stone Floor, 2005/06 and 2014 .....	26
Table 1.8: Access to Electricity, 2005/06 and 2014 .....	26
Table 1.9: Gross and Net Enrollment in School for Children .....	27
Table 1.10: Illness and Health care, 2005/06 and 2014.....	28
Table 1.11: Vaccination Rates for Children (12-23 months).....	30
Table 1.12: Vaccination Rates for Children (12-23 Months), 2014.....	30
Table 2.1: Conflict Questions in the Gallup World Poll Administered in Yemen in 2015 and 2016 .....	34
Table 2.2: Changes in Subjective Measures of Well Being from Gallup Surveys, 2014-2016.....	37
Table 2.3: Real GDP Growth Estimates for 2015 and 2016, Yemen .....	42
Table 2.4: Overall Employment by Sectors and Estimated Post-Conflict Changes.....	42
Table 2.5: Simulated Poverty and Inequality Changes in Yemen, 2014-2016 .....	44
Table 2.6: Income shares by various income categories .....	46
Table 2.7: Change in Expenditure and Poverty Following the Capture of Sana'a by Region.....	47
Table 2.8: Change in Other Welfare Measures Following the Capture of Sana'a, 2014 .....	48
Table 3.1: Changes in Depth of Nutrient Deficiencies by Disadvantaged Status.....	66
Table 3.2: Potential Seasonality in Food Availability .....	69
Table 3.3: Change in Access to Food in Sana'a Following Rebel Control.....	70
Table 3.4: Change in Price of Calories and Diet Quality following the Removal of the Fuel Subsidy.....	71
Table 3.5: Change in Price of Calories and Diet Quality following the Removal of the Fuel Subsidy by Region .....	72
Table 4.1: Descriptive Statistics by Sector and Gender of Head, 2014.....	81
Table 4.2: Descriptive Statistics by Sector and Gender of Head, 2005/06 .....	82
Table 4.3: Descriptive Statistics for Marital Status for Women aged 15 to 49.....	85
Table 4.4: Descriptive Statistics for Migration and Remittances by Sector and Gender of Head, 2014 ....	86
Table 4.5: Remittances Received as a Share of Household Expenditure, 2014.....	88
Table 4.6: Descriptive Statistics for Public Transfers by Sector, 2014 .....	90
Table 4.7: Descriptive Statistics for Public Transfers by Sector, 2005/06 .....	91
Table 4.8: Transfer Incidence by Net Expenditure Deciles 2014 (proportion of population living in households receiving each transfer).....	92
Table 4.9: Transfer Incidence by Net Expenditure Deciles 2005/06 (proportion of population living in households receiving each transfer).....	93
Table 4.10: Public transfers as a Share of Household Expenditures by Expenditure Deciles, 2014 .....	94
Table 4.11: Public Transfers Received as a Share of Household Expenditure, 2005/06 .....	95
Table 4.12: Descriptive Statistics for Households with Disabled or Chronically Ill Household Heads.....	102
Table 4.13: Estimated SWF Target Population and Coverage in 2014 (%) .....	104
Table 4.14: Economies of Scale in Transfers, 2014.....	106

Table 4.15: Transfers and Gender of Household Head, 2014.....	108
Table 4.16: Are Female Headed Households Poorer? (2014).....	110
Table 4.17: Share of Population Receiving both Public and Private Transfers, 2014.....	111
Table 4.18: Poverty Rates without Public and Private Transfers, 2014.....	112
Table 4.19: Descriptive Statistics for Shocks by Sector.....	113
Table 4.20: Social Assistance and Household Shocks.....	115
Table 5.1: Purchase and Consumption Modules in the 2014 HBS.....	120
Table 5.2: Units of Measurement in Food Diaries in the 2014 HBS.....	120
Table 5.3: Durable Goods, Average Ownership and Assumed Usable Life.....	124
Table 5.4: Median Paasche Index by Strata.....	127
Table 5.5: Poverty Headcount Rate by National, Urban/Rural and Governorate using 2014 HBS.....	133

## List of Figures

Figure 1.1: Log Per Capita Consumption Expenditure CDF, 2005/06 and 2014.....	15
Figure 1.2: Growth Incidence Curve of Per Capita Consumption Expenditure, 2005/06-2014.....	16
Figure 1.3: Ratio of Per Capita Consumption Expenditure at Different Percentiles.....	18
Figure 1.4: Poverty Rates at the Level of Yemeni Governorates, 2014.....	18
Figure 1.5: Household Size and Poverty, 2005/06 and 2014.....	20
Figure 1.6: Poverty by Education Level of the Household Head, 2005/06 and 2014.....	20
Figure 1.7: Poverty Rates by Household Head Occupation.....	21
Figure 1.8: Poverty Rates by Sector of Employment (among those in wage occupations).....	21
Figure 1.9: Asset Ownership, 2005/06 and 2014.....	23
Figure 1.10: Household Access to Improved Water, Sufficient and Improved Water, and Improved Sanitation by Quintile, 2014.....	25
Figure 1.11: Use of Private School for Children's Schooling.....	28
Figure 1.12: Type of Disease and Accident, 2014.....	29
Figure 1.13: Type of Disease and Accident, 2014.....	29
Figure 2.1: Real Growth in Yemen, 2012-2016.....	33
Figure 2.2: Loss of Livelihood and Assets by August 2016.....	36
Figure 2.3: Conceptual Summary of the Microsimulation Methodology.....	38
Figure 2.4: Poverty Trend in Yemen Using Simulated Results for 2016 (% of population).....	43
Figure 2.5: Growth Incidence Curve between 2014 and 2016.....	45
Figure 3.1: Undernourishment in 2014.....	59
Figure 3.2: Share of the Population by Number of Nutrient Deficiencies.....	61
Figure 3.3: Undernourishment by Poverty Status.....	63
Figure 3.4: Composition of Consumption.....	64
Figure 3.5: Per Capita Consumption by Type of Estimate.....	67
Figure 4.1: Household Size and Age of Head by Gender of Head, 2014.....	83
Figure 4.2: Household Size and Age of Head by Gender of Head, 2005/06.....	84
Figure 4.3: Per Capita Transfers by Gross and Net Expenditure Percentiles, 2014.....	96
Figure 4.4: Per Capita Transfers by Gross and Net Expenditure Percentiles, 2005/06.....	97
Figure 4.5: Social Welfare Transfers by Gross and Net Expenditure Percentiles, 2014.....	98
Figure 4.6: Social Welfare Transfers by Gross and Net Expenditure Percentiles, 2005/06.....	99

Figure 4.7: Transfer Incidence and Average Transfer Amounts by Gross and Net Expenditure Percentiles, 2014 .....	100
Figure 4.8: Transfer Incidence by Net Expenditure Percentiles Over Time .....	101
Figure 5.1: Consumption Category Shares.....	128
Figure 5.2 Caloric Intake Shares by National, Urban/Rural and Consumption Deciles .....	130
Figure 5.3: Average cost per calorie by consumption deciles (2014 prices).....	131

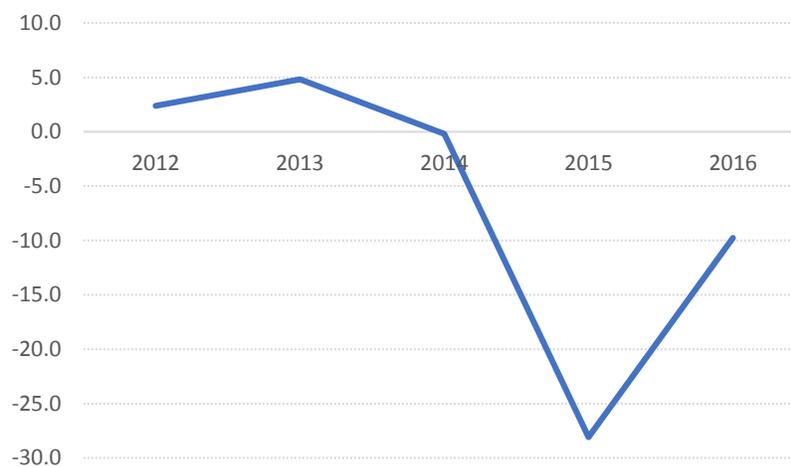
## List of Boxes

Box 2.1: Conflict and the Economy- Night Time Lights over Yemen.....	33
Box 2.2: Incorporating Internal Displacement in the Simulation Model .....	40
Box 3.1: Food Security in the Gallup World Poll After the Escalation of Conflict.....	60
Box 3.2: How is food insecurity defined?.....	62
Box 3.3: Uncertainty in Estimates of Food Consumption .....	65

## Overview

**From a country described throughout history as the “Arabian Felix”—a land of prosperity and happiness—Yemen has descended into war, economic collapse and destitution.** The escalation of conflict in the past two years has had enormous human costs and the damage to physical infrastructure and the deterioration of the overall security environment has paralyzed the economy. Latest estimates suggest that real GDP has contracted by 35 percent since late 2014. An estimated 8 million Yemenis have seen their livelihoods collapse and are living in communities with minimal to no basic services.

**Figure 1: Real GDP growth in Yemen, 2012-16**

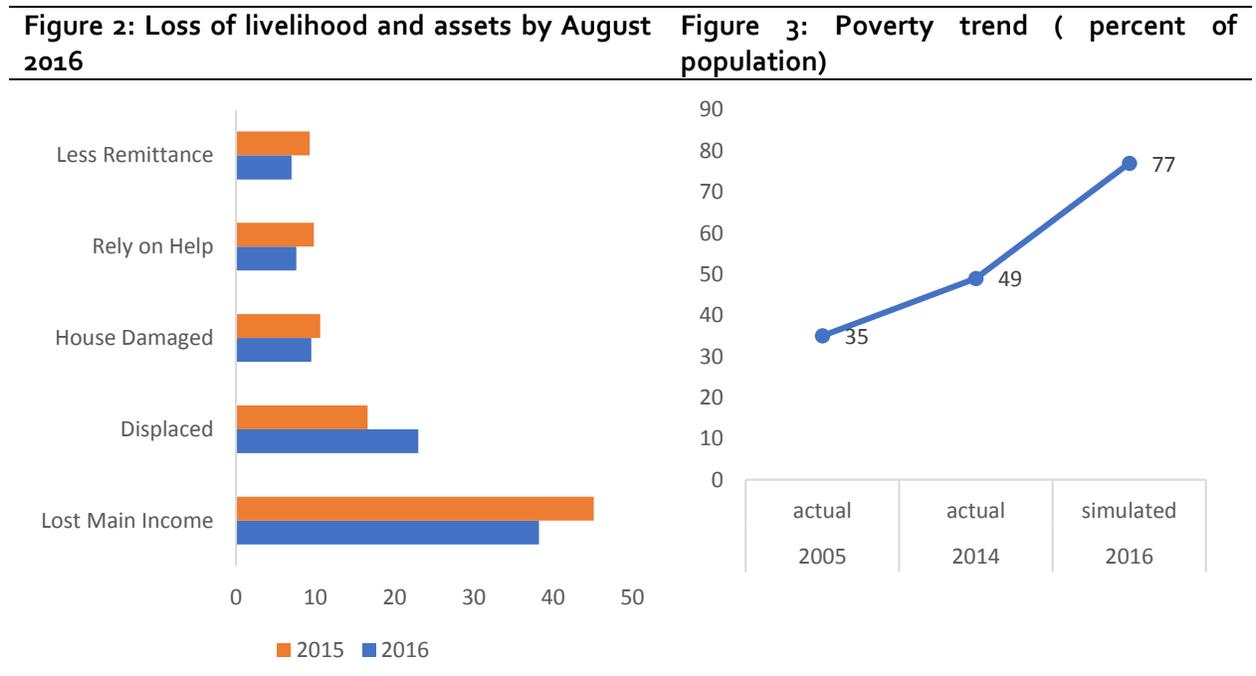


Source: IMF staff estimates.

**Poverty was already increasing in Yemen...** Analysis of data from the most recent nationally representative household survey in Yemen, the Yemen Household Budget 2014, suggests that poverty in Yemen increased from 35 percent to 49 percent between 2005 and 2014. This 14-percentage-point increase is a remarkable loss of welfare for a country that was already one of the poorest in the region. The increase in poverty was proportionately sharper in rural areas of Yemen, where it increased from 42 percent to 59 percent.

**...but the post-2014 escalation of violence and conflict is likely to have depressed living standards further, with an estimated 77 percent of the population living under poverty in 2016.** With over 35 percent of the population reporting to have lost their main source of income in 2015 and 2016, and close to 10 percent of the population reporting having experienced a decline in remittances or having had to rely on help from others, housing damage or physical displacement, living standards are likely to have deteriorated even further. Microsimulation techniques that take into account the impact of the economic collapse on available labor market opportunities (employment as well as earnings), partial non-payment

of public sector salaries and other public transfers, such as those through the Social Welfare Fund—Yemen’s flagship social assistance program—suggest that the headcount poverty rate in 2016 could have surged as high as 77 percent in 2016. In terms of the number of poor, this translates to 21 million and is 8 million higher than the number of poor estimated from the Household Budget Survey of 2014.



Source: World Bank staff calculations based on Gallup World Poll Surveys and Household Budget Survey Data, 2005 and 2014.

**Even though everyone has been affected by the conflict, the poor have borne a heavier burden.** Yemen became more unequal between 2005 and 2014, with the Gini index growing from 34.7 to 36.7. This trend is likely to have continued post 2014 as well. The source of income that has been affected the most due to the escalation of conflict in the past few years is labor income. Since labor income is often the most important source of income for the poor and those around the bottom of the distribution, the effects of the crisis have been much more pronounced at the lower end of the distribution. Simulations show sharper increases in Gini, poverty gap and severity of poverty indices between 2014 and 2016.

**Food access in Yemen was already very poor in 2014...** About 10.8 million Yemenis were undernourished in 2014—about 41 percent of the total population—and much larger shares of the population suffered from nutrient deficiencies. Prevalence of both undernourishment and nutrient deficiencies among children in 2014 was already high, suggesting that a large share of the young Yemeni population could struggle to develop adequate human capital to lead productive lives, and future generations might continue to be affected by the poor state of food access in 2014.

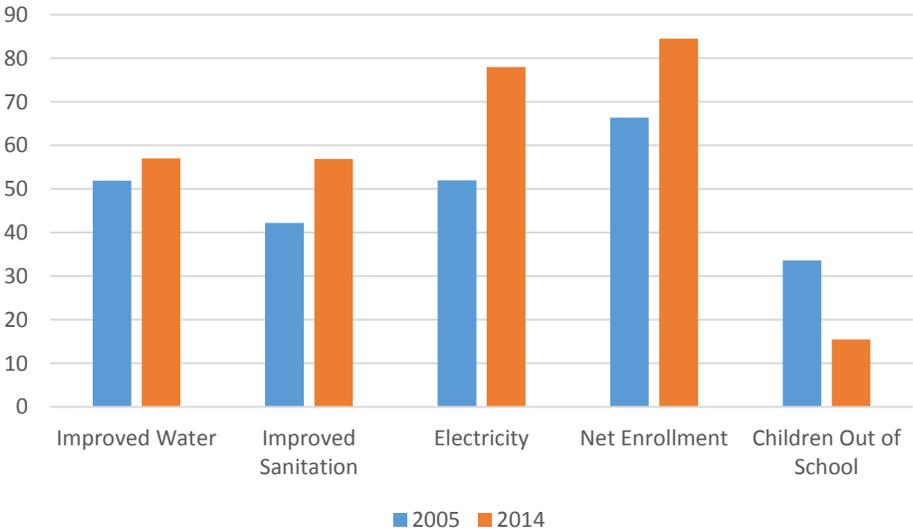
**... but the conflict has dramatically worsened food security relative to an already poor baseline and the specter of famine threatens to further imperil the human potential of the next generation of Yemenis.** Estimates from the 2014 HBS suggest a decline in access to food following the Houthi capture

of Sana'a. Estimates using the Gallup World Poll further suggest that conflict had a dramatic adverse effect on households in 2015 and 2016, where households directly affected economically by the conflict were much more likely to report experiences consistent with extreme undernourishment. A little over half of the population was directly affected economically by the conflict by August 2016, which suggests the current food security situation is dire for a large share of Yemenis. The continued difficulties in the availability and access to food due to the collapse of markets and purchasing power of the households not only raises alarms about hunger and undernourishment in the present but also the possibility of an entire generation of Yemenis having the formative years of their childhood scarred by severe malnutrition.

**Yemen had made important gains in non-income dimensions of well-being before the current crisis.**

In circumstances in which not all goods and services that households require to have a decent life are available for purchase in the market, monetary measures of poverty often provide only a partial picture of welfare. Looking at non-monetary measures, Yemen seems to have overcome overwhelming odds and made some decent progress between 2005 and 2014. For example, despite declining water-resource availability within the country, there was a slight improvement (52 percent to 57 percent) in access to improved water. Similarly, access to improved sanitation increased from 42 percent in 2005 to 57 percent in 2014, with larger proportional improvements realized by the poorer segments of the population. Electricity access increased from 52 percent of the population to 78 percent during the same period, propelled by a significant increase in rural electrification. School enrollment increased (66 percent to 84 percent), fewer children were out of school (34 percent to 16 percent), and gender gaps were significantly closer.

**Figure 4: Non-income dimensions of well-being – access to key services**



Source: World Bank staff calculations based on HBS 2005 and HBS 2014.

**Yet, the large-scale physical destruction of infrastructure associated with the delivery of these services post 2014 threatens to reverse these hard won gains.** A recently conducted Damage and Needs Assessment exercise that focused on four key metropolitan areas of Yemen, namely Sana'a, Aden, Taiz and Zinjibar found key assets in six sectors (education, health, energy, water and sanitation, transport and housing) to have been badly damaged. In particular, 50 percent of analyzed infrastructure in energy, 25 percent of infrastructure in education and health and 10 percent in housing were found to have been damaged. The destruction of these essential infrastructure assets, together with the worsening security situation across the country, threatens to erode some of the hard won gains the country has made in the provision of basic services to its people before the conflict escalated.

**Yemeni households relied significantly on public and private transfers at the start of the current crisis in 2014.** In 2014, just prior to the current crisis, many Yemeni households relied on public and/or private transfers. Private remittances from within and outside the country were particularly critical to household living standards: reaching 27 percent of the population and equaling 27 percent of recipients' living standards, although only 3 percent if considering Yemen's total population. Government pensions also afforded their few beneficiaries, around 8 percent of Yemen's population, an adequate standard of living. Finally, some 45 percent of the national population lived in households that benefitted from at least one type of public social assistance or charity-related transfer. Estimates suggest that the poverty rates in 2014 would have been 5 percentage points higher than the estimated 49 percent without these transfers.

**However, the protective cover of these transfers is likely to have been severely tested post 2014, particularly as the generosity, as well as targeting of Yemen's flagship transfer programs such the Social Welfare Fund, leaves much room for improvement.** Transfer amounts are small and the targeting mechanism has not been updated since 2008. As a result, while the most important social assistance program, the Social Welfare Fund (SWF), is intended to be targeted towards the poor, almost half of its recipients are non-poor and over 60 percent of the poor are non-recipients. Although coverage and targeting could be improved, the key issue with respect to social assistance programs, including the SWF, is the tiny size of the transfers and the fact that targeting is not adjusted regularly. In future reforms, more attention needs to be paid to transfer sizes, along with efforts to increase coverage, and a regular re-certification and re-targeting of its beneficiaries.

### **Policy directions**

Obviously, what Yemen needs most today to address its rapidly worsening poverty and humanitarian conditions is a cessation of hostilities and a return to peace. But even in the interim, the analyses presented in this report point to four key urgent priorities:

First, collapsing labor markets have led to complete livelihood losses for many in Yemen. Providing income support either through cash transfers or through other temporary cash-for-work initiatives to restore some purchasing power in the hands of poor Yemenis is of paramount importance.

Second, the current spike in food insecurity is as much about the lack of household purchasing power to access food from the market as it is about the non-availability of food in the market in the first place. Yemen imports 90 percent of its food from the international markets and, given the collapse of banking and financial services that are the key facilitators of the payment system, accessing foreign currency required for the procurement of food from international markets is difficult. Even when food is brought to the ports, the logistics of transporting it to the most affected regions is complicated by the destruction of key road networks and security challenges. Relaxing some of these constraints on the availability of food at various levels should also be an urgent priority.

Third, during times of crisis such as the one Yemen is undergoing now, it is important to protect the most vulnerable within the population. Pregnant and lactating women and children are particularly vulnerable to nutritional shortfalls when food availability at the household level drops. Often the switch to cheaper calories comes at the cost of essential micronutrients and this could have long-term implications for the human development of the next generation of Yemenis. When food prices are increasing dramatically, the purchasing power of cash assistance can erode rapidly, so in-kind assistance, potentially with mineral and micronutrient fortification, should be considered hand-in-hand with cash assistance. Finally, and perhaps in the medium term, reconstruction of Yemen's broken infrastructure will be instrumental in helping households to rebuild their asset stock and begin to start reclaiming their livelihoods.

## Chapter 1 : Poverty in Yemen, 2005-2014<sup>1</sup>

The Yemen Household Budget (HBS) 2014 survey provides a unique opportunity to update the available knowledge and understanding of poverty in Yemen. Coming almost a decade after the last time a similarly comprehensive analysis of living standards was carried out in the country using the 2005 version the data, it provides a useful snapshot of income and non-income dimensions of poverty in 2014. Even though Yemen has undergone dramatic changes since the year of data collection, this chapter presents a conventional diagnostic of the poverty trends and profiles for Yemen based on the 2014 round of the HBS. The analysis will also draw on the 2005/06 round to make comparisons whenever required. A more technical discussion of the poverty measurement methodology is provided separately in Chapter 5 and a related discussion of a more current picture of poverty based on microsimulation techniques is provided in Chapter 2.

### Poverty trends

There has been a significant increase in poverty in the Republic of Yemen. According to data from the latest HBS, the headcount poverty rate in the Republic of Yemen stands at 48.6 percent of the population in 2014. This is an increase from 2005/06 when the comparable estimate was 35.4 percent.<sup>2</sup>(Table 1.1). These rates imply that the number of poor increased from 7.0 million to 12.6 million with an overall increase of 5.5 million between the two survey rounds.

In addition to the overall headcount, the depth and severity of poverty also increased over time. The depth of poverty, which is conventionally measured by the poverty gap index, increased from 9.5 to 15.5 during this period. Poverty gap index is often also understood as the cost of eliminating poverty (relative to the poverty line) as it depicts the average amount of resources, as a percentage of the poverty line, that would need to be transferred to bring the income of all the poor in the population up to the poverty line, giving all individuals below the poverty line equal weight. Severity of poverty, measured as the squared poverty gap index, puts a higher weight on observations that fall well below the poverty line. The squared poverty gap increased from 3.6 to 6.7 between 2005/06 to 2014 suggesting an increase in poverty severity.

Table 1.1: Headcount Poverty Rate, the Republic of Yemen

	2005/06			2014		
	National	Urban	Rural	National	Urban	Rural
Headcount poverty rate (P0)	35.4	17.5	42.1	48.6	23.9	59.2
Poverty gap (x100)	9.5	3.8	11.7	15.5	6.6	19.3
Squared poverty gap (x 100)	3.6	1.3	4.5	6.7	2.6	8.5

Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

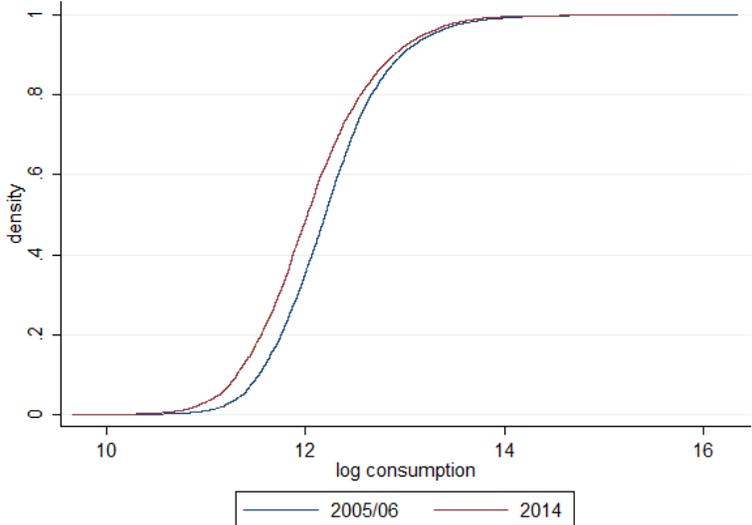
<sup>1</sup> Primary authors: Sushant Joshi and Sailesh Tiwari

<sup>2</sup> The methodology used for the official estimate of poverty in 2005/06 was the household specific poverty line method whereas poverty in 2014 has been estimated using the widely accepted cost-of-basic-needs (CBN) approach. All discussion of trends in this chapter are based on comparable poverty estimates calculated for 2005/06. See Chapter 5 for details on this distinction.

Poverty is higher and has also increased faster in rural areas. Rural poverty was at 59.2 percent in contrast to 23.9 percent poverty for urban areas in 2014. This suggests that the poverty in Yemen is concentrated in rural areas. Rural areas also saw a faster increase in poverty than urban areas between 2005 and 2014; rural poverty increased by about 15 percentage point in comparison to a 6 percentage points increase in urban poverty. In terms of the number of poor, this translates to an increase from 960,000 to 1.9 million in urban areas and a more dramatic growth from 6.1 million to 10.7 million in rural areas. The depth and severity of poverty are also higher in rural areas than in the urban areas.

The increase in poverty suggests a widespread deterioration of living standards. Per capita household consumption expenditure has declined in Yemen. Average per capita consumption was 217072 in 2014, 13.4 percent lower than 250651 Riyals in 2005. In addition to the mean, the entire distribution of per capita consumption for 2005 dominates the expenditure distribution for 2014 suggesting that the consumption distribution for the country may have shifted to the left during this time. (Figure 1.1)

Figure 1.1: Log Per Capita Consumption Expenditure CDF, 2005/06 and 2014



Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

This secular decline in living standards explains a bulk of the increase in poverty. Poverty can increase, or more generally, welfare of those towards the bottom end of the distribution can worsen either due to a decline in average levels of consumption in the population, or for any given level of consumption, by the worsening of the distribution of consumption. There are several techniques to apportion shares or contribution of welfare changes between this “growth” effect and the “distribution” effect and one popular one used commonly in the poverty literature is the Datt-Ravallion decomposition. The results of the application of the Datt-Ravallion decomposition to the increase in poverty in Yemen suggests that a sizeable proportion of the increase is explained by the growth component with a relatively smaller role played by the redistribution component. (Table 1.2)

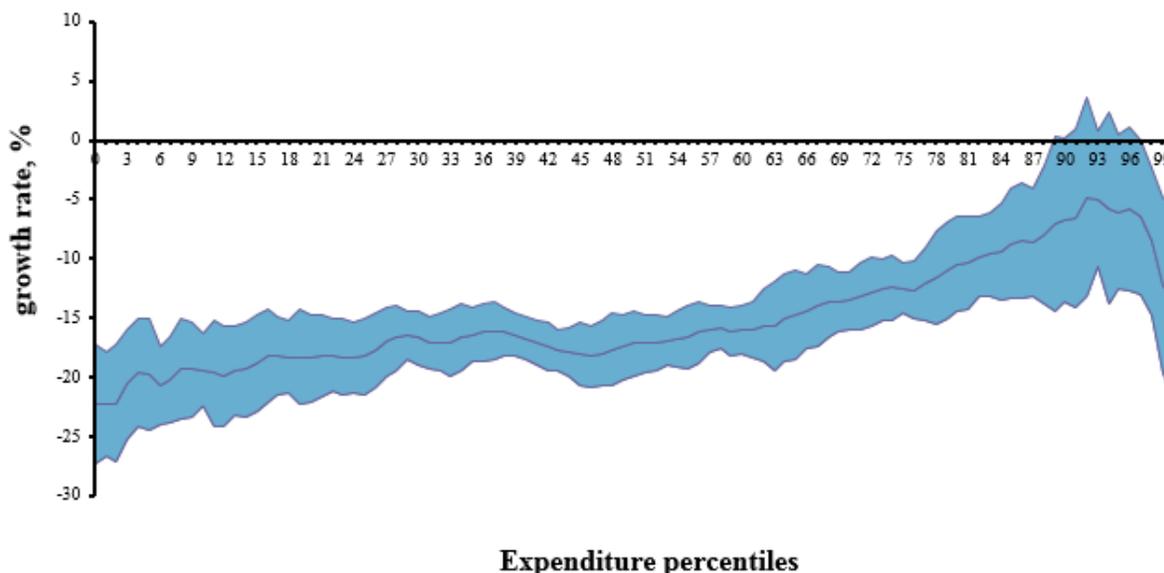
Table 1.2: Growth and Inequality Poverty Decomposition

Change in Poverty	Growth component	Redistribution component	Interaction component
13.2	10.3	3.2	-0.38

Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

This is not to say that distributional issues are not important. Looking at the growth incidence curve (GIC) of per capita consumption between these two periods, it is evident that the poorer Yemenis have witnessed deeper cuts in consumption. (Figure 1.2)

Figure 1.2: Growth Incidence Curve of Per Capita Consumption Expenditure, 2005/06-2014



Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

## Inequality

As can be inferred from the GIC in Figure 1.2 above, inequality increased in the Republic of Yemen. The Gini index increased from 34.7 in 2005/05 to 36.7 in 2014. The Gini index is one of the most commonly used measures of inequality. Its value ranges from a 0 to 100 with the value of 100 corresponding to perfect inequality and value of 0 corresponding to perfect equality. One common shortcoming of the Gini is that it does not satisfy the additive decomposability property, which is often useful in practical applications to show the sources of inequality. There is an entire class of generalized entropy measures of inequality that satisfy these decomposability properties and they confirm the slight increase in inequality in Yemen during this period. Theil L, which is also the GE(0) measure or the mean log deviation, increased from 20.0 to 22.2. Likewise, the Theil T index increased from 24.3 to 25.5. (Table 1.3)

Table 1.3: Inequality Measures 2005/06 and 2014

	2005/06	2014
Gini	34.7	36.7
Theil L – GE (0)	20.0	22.2
Theil T – GE(1)	24.3	25.5

Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

Inequality within urban areas is higher than inequality within rural areas suggesting more unequal consumption distribution in urban areas. But over time, the measures of inequality appear to have changed very little between urban and rural areas between 2005/06 and 2014. So, what explains the small growth in overall inequality between the two rounds? Is it that inequality *within* urban and rural areas increased or did the gaps *between* urban and rural areas get bigger? Considering just the Theil-L index or the GE(0) which is also known as the mean log deviation, the answer appears to be a little bit of both. While the inequality within urban and rural areas explains a large share of the overall inequality, the overall increase in inequality for the country appears to stem from an increase of both kinds of inequality. (Table 1.4)

Table 1.4: Inequality Measures 2005/06 and 2014

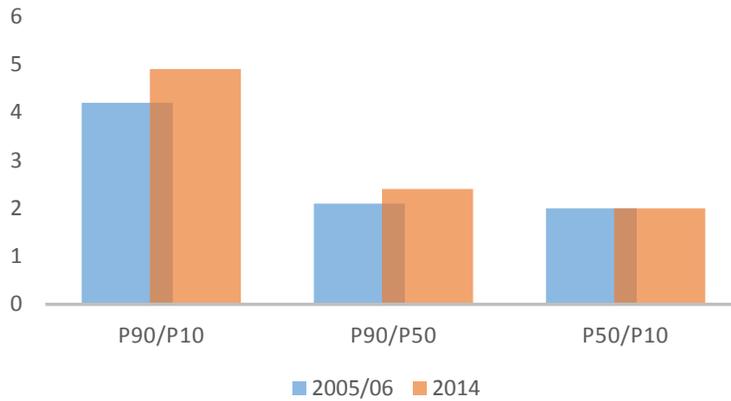
	2005/06				2014			
	Urban	Rural	Within	Between	Urban	Rural	Within	Between
Gini	37.1	29.6	..	..	37.0	30.6	..	..
GE(0)	22.7	14.7	16.9	3.2	23.0	15.4	17.7	4.5
GE(1)	26.4	17.4	21.0	3.4	25.6	16.8	20.7	4.7

Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

Other measures of inequality such as the variant of the Palma index also confirm the slight growth in inequality in Yemen.<sup>3</sup> Unlike measures such as Gini that compute inequality based on the shape of the entire distribution of consumption, indices such as Palma compute inequality at particular points in the income/consumption distribution. By putting more emphasis on the tails, in some ways this measure is sensitive to the issue of missing top incomes and associated biases in conventional measures of inequality. Figure 1.3 shows three different Palma ratios for Yemen: the 90/10, 90/50 and the 50/10. Each of these ratios is essentially the ratio of the consumption level at each of these percentiles. The results show that the 50/10 ratio has broadly stayed stable over time while the 90/50 ratio has increased slightly. The key takeaway here is that the slight increase in the consumption ratio between the 90<sup>th</sup> and the 10<sup>th</sup> percentile of Yemen's consumption distribution between 2005/06 and 2014 is driven to a large extent by a widening of the consumption distribution above the median; below the median the distribution appears to have stayed fairly stable.

<sup>3</sup> The original Palma index proposes the ratio of the 10<sup>th</sup> percentile to the 40<sup>th</sup> percentile of the income distribution as the appropriate measure of inequality.

Figure 1.3: Ratio of Per Capita Consumption Expenditure at Different Percentiles

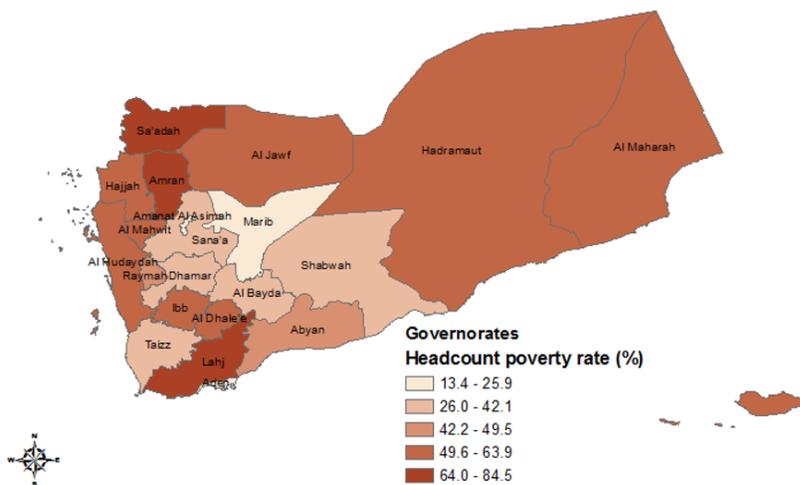


Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

### Poverty Profile

There is sizeable variation in headcount poverty rates by governorates. In 2014, Sadaah and Amran were the poorest governorates with headcount poverty rates of 84.5 percent and 75.9 percent, respectively. The incidence of poverty was the lowest in Sana’a City, at 13.4 percent of the population. Aden, the second largest city in the country, had a headcount poverty rate of 22.2 percent. Most of the population of the Republic of Yemen lives in the western part of the country. So, a high level of poverty in these governorates contributes significantly to national poverty estimates. In fact, Al-Hudeida, Ibb, Taizz and Hajjah are the governorates with the largest population of the poor in the country.

Figure 1.4: Poverty Rates at the Level of Yemeni Governorates, 2014



Source: World Bank staff calculations based on HBS 2014

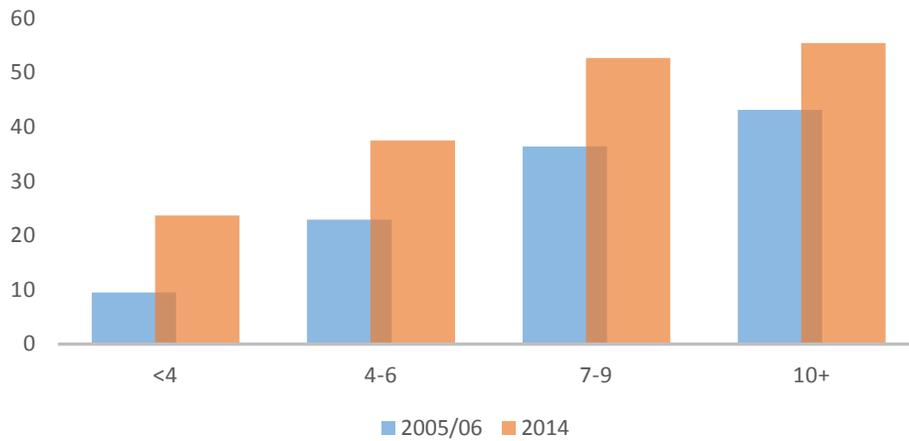
Table 1.5: Governorate Level Poverty Rates and Number of Individuals below Poverty Line, 2014

	Poverty rate (% of population)	# of poor
Ibb	56.6	1,503,818
Abyan	48.6	259,572
Sanaa City	13.4	376,818
Al-Baida	39.2	279,228
Taiz	41.4	1,236,077
Al-Jawf	55.4	305,807
Hajja	63.9	1,251,550
Al-Hodeida	58.1	1,685,621
Hadramout	60.6	828,631
Dhamar	31.1	547,049
Shabwah	42.1	248,665
Saadah	84.5	824,799
Sanaa Region	42.1	460,756
Aden	22.2	185,636
Laheg	69.1	634,004
Mareb	25.9	79,154
Al-Mahweet	60.7	390,135
Al-Maharh	57.8	76,832
Amran	75.9	768,438
Al-Dhale	59.8	391,412
Remah	49.5	257,867
Socatra	50.1	22,017
National	48.6	12,613,886

Source: World Bank staff calculations based on HBS 2014

Poverty is higher among larger households. Grouping households into four mutually exclusive categories with less than four members; four to six members; seven to nine members; and, more than 10 members it appears that there is a clear positive relationship between household size and poverty incidence with larger households more likely to be poor. (Figure 1.5) Even though smaller households are less likely to be poor, overall poverty has increased for all household sizes. For example, in 2005/06 only 9.5 percent of households with less than four members were poor. This increased to 23.7 percent in 2014.

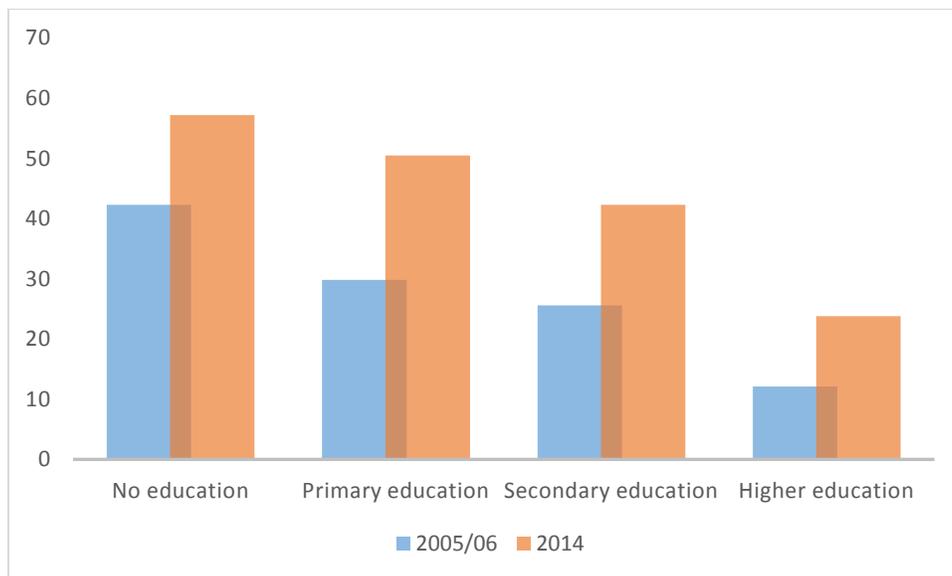
Figure 1.5: Household Size and Poverty, 2005/06 and 2014



Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

Households headed by better educated individuals are less likely to be in poverty. Poverty increased for households with heads with all levels educational attainment but within each round, there was monotonic relationship between household head education levels and poverty rates. For example, households with heads with no education had 57.2 percent poor in 2014. In comparison, households with heads with higher education had a significantly lower poverty rate of 23.8 percent. These results broadly suggest a positive association between the level of education and household not being in poverty.

Figure 1.6: Poverty by Education Level of the Household Head, 2005/06 and 2014

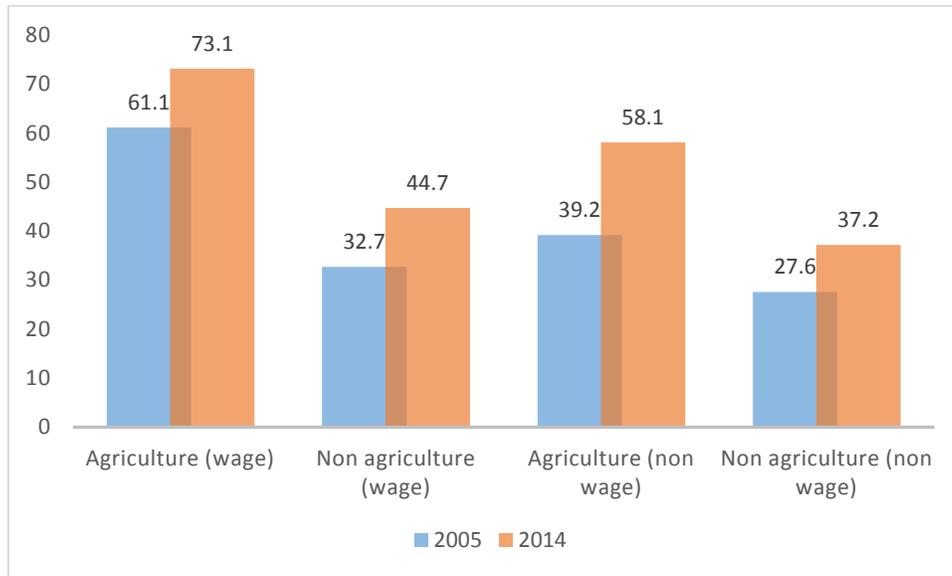


Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

Households headed by individuals working in wage agriculture have the highest likelihood of being in poverty, followed by those in agricultural self-employment/worker and wage employment in non-

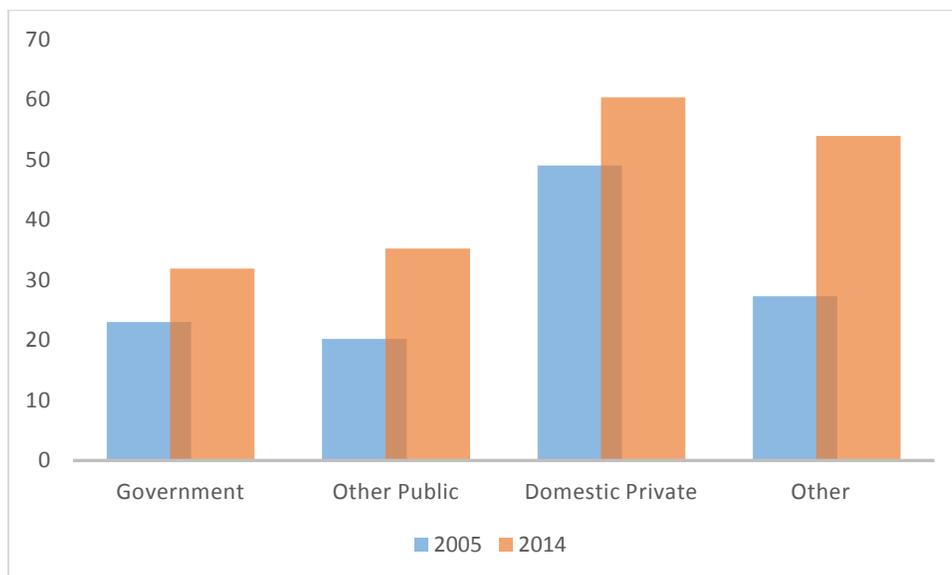
agricultural sectors. Households self-employed/worker in non-agricultural sectors have the lowest probability of being in poverty. This pattern is very similar between the two survey rounds and the while poverty rates increased for all occupation categories, the proportional increase was highest among agricultural self-employed/worker population. Among households headed by individuals holding wage paying occupations, the highest poverty rate was among those engaged in the domestic private sector and the lowest was among those in government and other public sector employment.

Figure 1.7: Poverty Rates by Household Head Occupation



Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

Figure 1.8: Poverty Rates by Sector of Employment (among those in wage occupations)



Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

Despite the sharp increase in the poverty rate, there has been an improvement in the ownership of several household assets. Figure 1.9 shows the details of ownership of a number of household assets. Household ownership of gas cylinders has increased significantly between the two household surveys. In 2005/06 only around 40 percent of households owned a gas cylinder. This has increased to around 80 percent in 2014. The difference in ownership between the top sixty and bottom forty has risen during this time in ownership of gas cylinder suggesting the faster rate of asset accumulation for the top sixty percentile. In addition to gas cylinder, ownership of blenders, refrigerator, and washing machines has increased during the two surveys. As with gas cylinder the ownership of these assets has also increased faster for top sixty than the bottom forty percentile. This suggests there is growing inequality in asset ownership for certain assets.

Private ownership of transportation vehicles is quite low with a clear gap in ownership of private car between the rich and the poor. Ownership of television, satellite dish, and mobile phone has increased between the two household surveys. There is a slight decline in ownership of land phone. This is mitigated by a sharp increase in ownership of mobile telephone. There is a clear gap in ownership of television, satellite dish, and mobile telephone between the top sixty percentile and the bottom forty.

The fact that asset accumulation has increased despite there being such a sharp increase in poverty is indeed an interesting development. One of the reasons for this could be the fact that the two survey rounds are separated by almost a decade which is long enough for there to be reversal of trends. For example, even at a slow rate, nine years would be a long enough time for there to be a decent amount of asset accumulation. Likewise, it is also possible that welfare as measured by household consumption started worsening only after 2011 when the country started becoming unstable whereas the asset accumulation was done much earlier.

Figure 1.9: Asset Ownership, 2005/06 and 2014



Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

## Non-income Dimensions of Wellbeing

How did Yemen fare between these two survey years on non-monetary measures of wellbeing? There are several advantages to measuring, monitoring and indeed analyzing poverty that is based on a money-metric measure of utility. But in settings in which not all goods and services that households require to have a decent life are available for purchase in the market, monetary measures of poverty often provide only a partial picture of welfare. While this chapter does not develop a full blown multi-dimensional poverty index for Yemen, it presents some statistics on the access of Yemeni people to some basic services that are unambiguously linked with human welfare. The spirit is to begin an exploration that will hopefully provide a well-rounded picture of poverty.

### Water and Sanitation

The Republic of Yemen is an arid to semi-arid country with very high water scarcity. Agriculture uses 90 percent of the water resources, a significant portion of which is being used for the cultivation of *qat*. According to the recently conducted WASH-Poverty Diagnostics (March, 2017) this scarcity is exacerbated by the lack of governance and regulatory mechanism to support an enforceable system to allocate water resources efficiently. To make matters worse, the availability of renewable water has been declining: annual per capita renewable water resource declined from 221 m<sup>3</sup> in 1992 to only 80 m<sup>3</sup> in 2014, and is a scant 1.3 percent of the global per capita average (5,925 m<sup>3</sup>) and just 14 percent of the MENA region per capita average (554 m<sup>3</sup>) (WDI 2016). This makes the issue of access to improved drinking water a critical marker of well-being for the Yemeni people.

Despite deterioration of overall water resource availability, there has been a slight increase in access to improved water for both the poor and non-poor households with the proportionate increase being a bit higher for the poor. Overall access increased from 52 percent in 2005/06 to 57 percent in 2014. (Table 1.6) Improved sources of water include piped water into a dwelling; to a yard or plot; from a public tap or standpipe, tube well or bore well, protected dug well, or a protected spring; or rainwater. Unimproved sources of drinking water include unprotected spring and dug well, cart with small drum or tank, tanker water, and surface water. Bottled water is defined as an improved source.

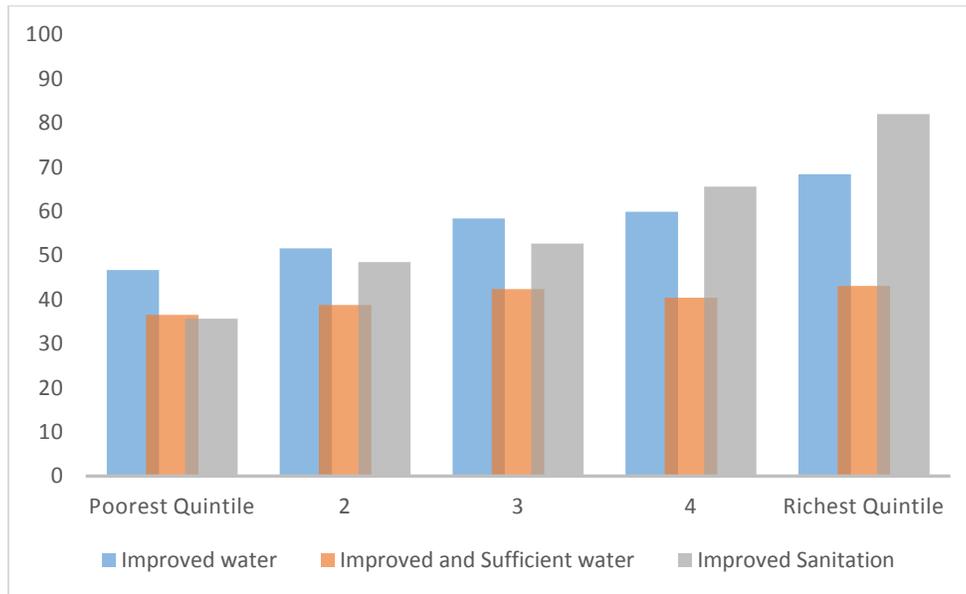
Despite the improvement, there has been a slight decline in perceived sufficiency of water among the non-poor who benefit from improved water. In general, wealthier households appear to have a higher likelihood of not being satisfied with the adequacy of their water, despite being the group with the highest likelihood of having access to improved sources. (Figure 1.10)

Table 1.6: Household Access to Improved Water, Sufficient and Improved Water, and Improved Sanitation

	2005/06			2014		
	National	Poor	Non-poor	National	Poor	Non Poor
Improved Water	51.9	38.3	59.4	57.0	50.5	63.1
Improved Water and Sufficient	37.6	27.2	43.3	40.2	38.6	41.8
Improved Sanitation	42.2	23	52.7	56.9	43.5	69.5

Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

Figure 1.10: Household Access to Improved Water, Sufficient and Improved Water, and Improved Sanitation by Quintile, 2014



Source: World Bank staff calculations based on HBS 2014

Access to improved sanitation also improved in Yemen during this period with larger proportional improvements among the poor than the non-poor. A household is deemed to have improved sanitation if it has all of the following: either a public network or covered pit for sewage disposal, a flush or non-flush toilet, and the toilet is non-shared then the household is defined to have improved sanitation. The average improvements still do not mask the fact that poor households are less likely to have access to improved sanitation as there is a clear welfare gradient in the access to improved sanitation. Part of this gradient is also explained by location: rural areas have higher levels of poverty and lag in improved access to sanitation as well.

#### Floor materials

The material that constitutes the occupied dwelling’s floor is one of the key components in the calculation of the Multi-Dimensional Poverty Index (the UNDP Human Development Report version) and thus there is some value to assessing the degree of deprivation along this dimension in Yemen. As expected, the poorer segments of the population in Yemen are more likely to live in dwellings with mud and stone floor but nationally, 6 percent fewer Yemenis lived in these houses in 2014 than in 2005/06. (Table 1.7)

Table 1.7: Mud and Stone Floor, 2005/06 and 2014

	2005/06	2014
Non Poor	33.2	25.0
Poor	64.3	51.8
Urban	13.6	13.3
Rural	55.7	48.7
Poorest Quintile	69.6	59.0
2	55.7	47.7
3	43.0	40.6
4	33.5	29.3
Richest Quintile	19.0	13.5
Total	44.2	38.0

Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

### Electricity

Access to electricity increased from 52 percent to 78 percent between 2005/06 and 2014 with much of the improvement coming from, what appears to be, a significant expansion of rural electrification. Electricity coverage in rural areas increased from 36 percent to 68 percent during this period. This benefitted the poor as well, with the access among the poor increasing at a faster higher rate than for the non-poor. It is not possible to infer from the data whether the improvement is due to the expansion of access to the national grid – which was a major infrastructure challenge for the country, or due to other small and medium sources including solar and wind power.

Table 1.8: Access to Electricity, 2005/06 and 2014

	2005/06	2014
Non Poor	63.3	89.8
Poor	31	64.4
Urban	95.3	99
Rural	35.5	68.2
Poorest Quintile	24.6	49.9
2	41.9	72.9
3	51.2	80.8
4	62.4	88.1
Richest Quintile	79.3	95.6
Total	51.9	77.5

Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

## Education

School enrollment rates increased between 2005/06 and 2014 and fewer children were out of school. Gross enrollment rates increased from 73.4 to 88.3 while net enrollment increased even faster from 66.4 to 84.5. The proportion of children out of school more than halved from 33.6 to 15.5. This progress was particularly pronounced at the lower end of the distribution. Gender gap in all three of these indicators has been reduced significantly though it is yet to be eliminated completely.

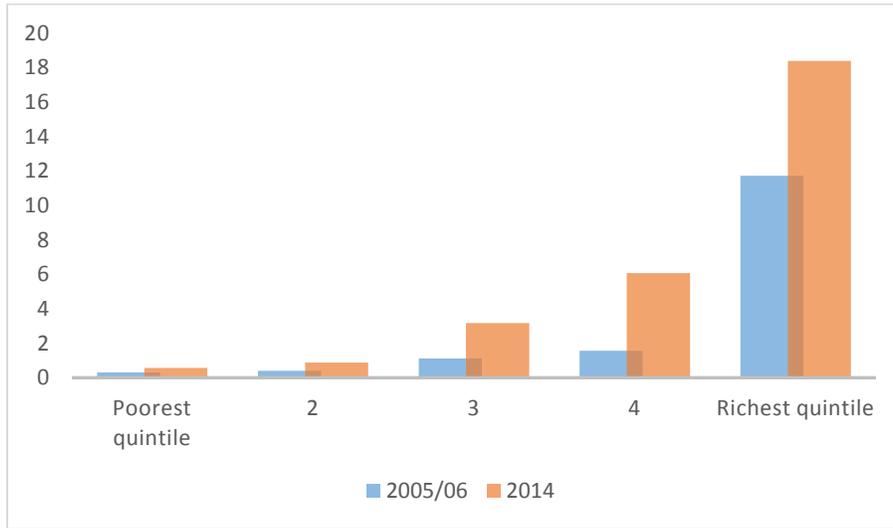
Table 1.9: Gross and Net Enrollment in School for Children

	Gross enrollment		Net enrollment		Not in School	
	2005/06	2014	2005/06	2014	2005/06	2014
Non Poor	79.2	89.7	72.4	85.3	27.6	14.7
Poor	64	86.8	57.8	83.7	42.2	16.3
Urban	87.2	91.2	81.5	87	18.5	13
Rural	68.1	87	61.6	83.5	38.4	16.5
Male	82	90.1	75.9	86.2	24.1	13.8
Female	62.6	86.1	56	82.4	44	17.6
Poorest Quintile	59.7	87.8	53.3	85.3	46.7	14.7
2	71.2	86.6	65.6	83.2	34.4	16.8
3	74.2	86.9	67.5	82.9	32.5	17.1
4	77.8	89.3	71.3	85.1	28.7	14.9
Richest Quintile	87	91	80.7	86.3	19.3	13.7
Total	73.4	88.3	66.4	84.5	33.6	15.5

Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

Education quality, especially in public schools, is often a key issue in many developing countries. Private alternatives have emerged in many settings and are available to parents able to afford these options. In Yemen too, enrollment in private schools has increased from 4.1 percent in 2005/06 to 7.4 percent in 2014. And as one could conjecture, the use of private alternatives for children's education is more prevalent among the better off parents. (Figure 1.11) Data from 2014 shows that around 18 per cent of children from the richest quintile go to private school while the number for those in the poorest quintile is less than one percent. The fairly steep jump from 6.1 percent to around 18 percent between the fourth to the fifth quintile suggests that private schools cater to the richest consumption expenditure quintile group in Yemen. Still, the fact that even for the richest segment, less than a fifth of the children use private providers suggests that public schools are still extremely important for the country.

Figure 1.11: Use of Private School for Children's Schooling



Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

## Health

Households with higher consumption self-report sickness or accidents at a higher level than poorer households. (Table 1.10) Around 24 percent of the household in the top sixty percentile report being sick or having an accident in 2014. This is in contrast to the bottom forty percent among whom only 20 percent reported being sick or have had an accident. It is often difficult to infer anything from this statistic on the health shocks experienced by households across the income ladder. For the same kind of health shock, health seeking behavior increases with increasing living standards so it is not surprising that self-reports of being in need of medical attention is higher among the wealthy.

But when they need care, the wealthy are also more likely to get care; those in the top sixty have a 10 percentage point higher likelihood of getting care when they need it than those in the the bottom forty. Poorer households are more likely to use public facility for their care, though the difference is only slight and the overall level of public facility use has declined for the entire population. There is a higher likelihood of utilizing a facility located in the neighborhood for the richer households. One possible reason this could be the case is that richer people tend to live in urban areas as noted earlier.

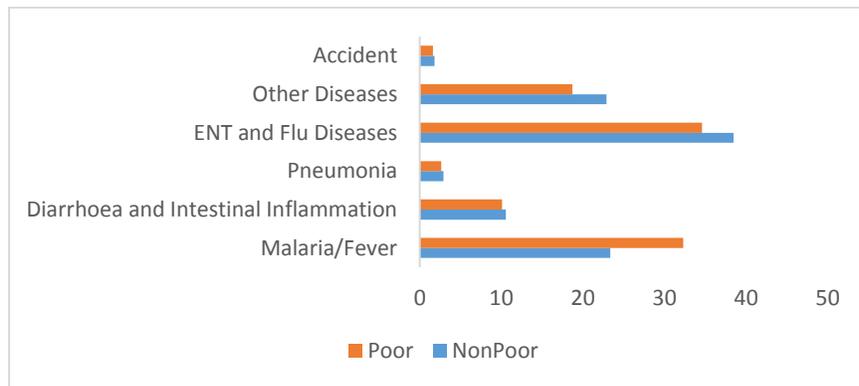
Table 1.10: Illness and Health care, 2005/06 and 2014

	2005/06			2014		
	Top Sixty	Bottom Forty	Total	Top Sixty	Bottom Forty	Total
Had Sickness or Accident	10.1	9.4	9.9	23.7	20.1	22.3
Got Medical Care	76.4	66.9	72.8	79.9	69.1	76
Went to Public Facility	30.6	33.2	31.5	21.7	25.9	23.1
Located in the Neighborhood	29.9	24.9	28.2	40.6	26.5	36.1

Source: World Bank staff calculations based on HBS 2005/06 and HBS 2014

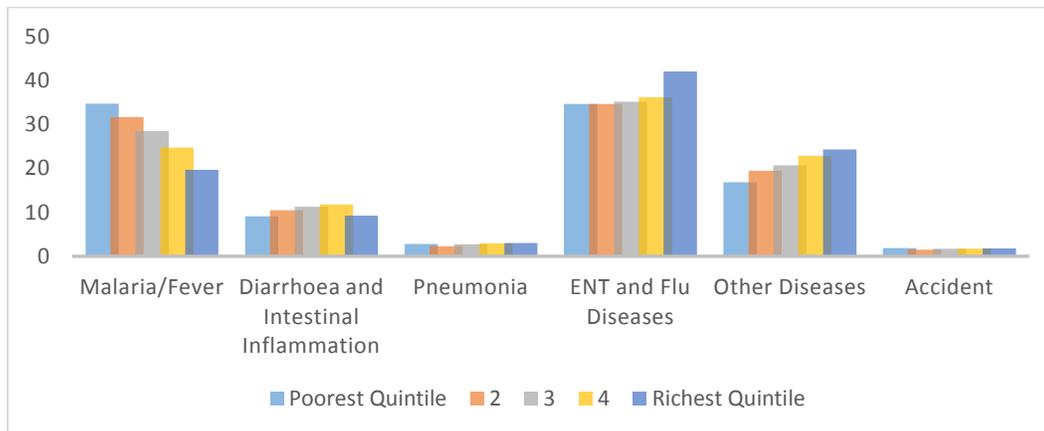
There are some interesting differences also in the burden of diseases between the rich and the poor. The rich and the poor have almost equal probabilities of meeting with an accident or catching pneumonia or even to an extent being afflicted with diarrhea or other intestinal diseases. But the non-poor are more likely to report ENT, and other flu related diseases. Looking deeper into incidence by quintile it becomes apparent that likelihood of reporting malaria/fever has a clear and a monotonic wealth gradient whereas the ENT and flu diseases appears fairly even for the bottom four quintile and spikes up quite a bit among the top 20 percent. While there is no further data here to adequately explain this curious pattern, two conjectures can be made. First, perhaps there are physical environmental factors associated with malarial incidence that are correlated with place of residence which may it turn be correlated with income. In other words, poorer households could live in areas with higher susceptibility to certain diseases. Second, for things like ENT, flu type issues, the wealthiest may be more likely to seek medical attention than any other for the same kind of symptoms.

Figure 1.12: Type of Disease and Accident, 2014



Source: World Bank staff calculations based on HBS 2014

Figure 1.13: Type of Disease and Accident, 2014



Source: World Bank staff calculations based on HBS 2014

Vaccination is linked with reduction in infectious diseases worldwide and the WHO considers a child to be fully immunized only after the child receives one BCG shot, at-least 3 polio shots, 3 DPTs, and one shot for measles. It is also recommended that the children receive these vaccines within a year of birth. Data

from the most recent round of the HBS (2014) shows that Yemen is very far from universalizing full immunization of children in their second year: only 2 in 5 Yemeni children were found to be fully immunized with important variation in vaccination rates by specific vaccines (See Table 1.11). While the results of the 2014 HBS and the Demographic and Health Survey which was conducted in 2013 are very similar, the immunization results in the Multi Indicator Cluster Survey (MICS) and the earlier vintage of the HBS, both conducted broadly in 2005 and 06 appear to diverge quite dramatically. In particular, the numbers from the earlier HBS stand in sharp contrast to reports of an improvement in overall immunization rates between 1997 and 2006 reported in the DHS 2013 report<sup>4</sup>. Due to these methodological issues, this report refrains from commenting on any recent trends in Yemen and instead uses 2014 HBS to analyze the vaccination rates across different groups and regions. (Table 1.12.)

Table 1.11: Vaccination Rates for Children (12-23 months)

	BCG	DPT_3	Polio_3	Measles	Full Vaccination	No vaccination
YMICS 2006	69.0	61.0	63.0	65.0	38.0	12.0
HBS 2005/06	74.3	67.6	78.9	75.7	59.8	7.6
YDHS 2013	67.6	59.6	58.7	63.3	42.6	16
HBS 2014	74.1	48.8	67.8	71.8	41.5	8.9

Note: Data for HBS 2005/06 and HBS 2014 were calculated by World Bank staff based on HBS 2005/06 and HBS 2014. Data for YDHS 2013 and YMICS 2006 are taken from the Yemen DHS 2013 report.

Poorer children are less likely to be vaccinated. In 2014, only 36 percent of children living in poor households had been fully vaccinated in contrast to 48 per cent for the children living in non-poor households. There is also a significant difference between the children living in urban and rural areas. Children in urban areas have full immunization at a higher rate. The gap in full immunization is more than 20 percentage points. There is no big difference in children receiving no vaccination at all by regions.

Table 1.12: Vaccination Rates for Children (12-23 Months), 2014

	Full Vaccination	No Vaccination
Non Poor	47.9	7.5
Poor	35.8	10.1
Urban	57.7	7.4
Rural	35.4	9.4
Poorest Quintile	35.9	13
2	37.8	7.8
3	33.9	7.4
4	48.3	9.7
Richest Quintile	55.5	6.5
Total	41.5	8.9

Source: World Bank staff calculations based on HBS 2014.

<sup>4</sup> <http://dhsprogram.com/pubs/pdf/FR296/FR296.pdf>

## Chapter 2 : Projecting Poverty in Yemen into 2016<sup>5</sup>

The picture of overall wellbeing of the Yemeni population described in this report so far relies on the data from the household budget survey implemented in 2014. Yemen has been embroiled in a prolonged conflict since this survey was fielded and this conflict is likely to have affected the lives and livelihoods of the country's populace in deep and profound ways. A number of other organizations have demonstrated that many measures of welfare have dramatically declined since the beginning of 2015. For example, the Task Force on Population and Movement (TFPM), co-led by the Office of the United Nations High Commissioner for Refugees (UNHCR) and the International Organization of Migration (IOM), has estimated that 3 million people- approximately 11 percent of the population- were displaced as of January 2017 (TFPM 2017). Likewise, an FAO assessment in November of 2016 estimated that nearly 17 million individuals – or roughly 65 percent of the population – were food insecure. This is 6 million people more than the size of the food-insecure population estimated using the 2014 HBS data. (See detailed results in Chapter 3)

In a way, 2014 has to be considered fairly recent for a country in which the previous living standards measurement exercise was conducted about twelve years ago in 2005. However, the reality that the country could have changed quite dramatically since 2014 is undeniable. This chapter presents an effort to quantify changes in living standards and poverty in the country after 2014. The lack of available data limits the extent to which all facets of conflict and economic changes can be fully explored and exploited, but the objective is to make use of a standard microsimulation methodology to present some estimates of the extent of deterioration of living standards in the country and see if some broad validation can be found in other sources such as the Gallup World Poll. The rest of the chapter provides a description of the conflict and its economic consequences, introduces the microsimulation methodology and highlights some key results.

### The Conflict and its Economic Impact

#### A Brief History

Cycles of violence and civil wars have dogged Yemen ever since it became a Republic in 1962. The country witnessed a sequence of turbulences and armed conflicts over control of power, in what was formerly the North as well as South Yemen. Regional and international powers often dominated the state of affairs during the Egyptian-Saudi era in the early 1960s through the Soviet-Western era in the 1970s and 1980s. With Ali Abdullah Saleh assuming the Presidency in North Yemen in 1978, open conflict faded with the exception of two prominent events: a 3-month conflict in 1994 following the unification of North and South in 1990; and, a bloody civil war in South Yemen in 1986 that forced thousands of Yemenis to flee into the North, including the then President Abd Rabbuh Mansour Hadi.

A semblance of stability was gained under President Ali Abdullah Saleh but it came at a price. The 33 year rule of President Saleh saw social and economic progress, with improvements in the access to education, health services, and basic infrastructure, and the establishment of modern institutions in line with Yemen's Republican vision and aspirations. Growth was driven by a small (by regional standards) but thriving hydrocarbon economy.<sup>6</sup> The emerging modern economic sector remained small and tightly

---

<sup>5</sup> Primary Authors: Sailesh Tiwari, Sharad Alan Tandon and Sushant Joshi

<sup>6</sup> See also: Yemen – Unlocking the Potential for Economic Growth, a Country Economic Memorandum, October 2015, World Bank, report no. 102151-YE.

controlled, if not outright state owned. Given Yemen's strong tribal traditions, especially in the former North, modern political structures and institutions were often merged with or overtaken by tribal agenda. The rise of a patronage system during the Saleh administration was as much a reflection of the diversity of interests his administration had to deal with as patronage was – and always has been in Yemen – a way to reach an agreement. While this style of governance brought stability, it also undermined credibility of institutions – including at the central state level – or limited their operational effectiveness.

As the external economic environment turned unfavorable, the social contract came under pressure and the brittle institutions could only hold for so long. The Arab Spring revolutions that had swept other countries of the region in 2011 eventually spilled over to Yemen leading to intensified demands for better services, employment opportunities, and more political accountability. But an economic system hamstrung by disappointing growth due to tight controls of economic assets and a declining hydrocarbon sector could not cope. A mediated settlement was reached heralding the end of the Saleh's thirty three year rule to an end in 2011.

### The National Dialogue, Residual Resentment and Civil War

The interim President Abdrabbuh Mansour Hadi and an opposition-led unity government were given the responsibility of overseeing national reconciliation under a three-year transition period. This agreement was sponsored by the Gulf Cooperation Council (GCC) and was also backed the United Nations. As part of this reconciliation effort, Yemen launched the National Dialogue Conference in March 2013 with the aim of fostering an inclusive dialogue among different stakeholders in the country to negotiate a new constitution and a social contract better attuned to the needs and wants of the Yemeni population. Unfortunately, the political transition could not be concluded as envisaged by the NDC process. Among others, the issue of delineation of boundaries of the six federal provinces proposed in the Yemeni constitution became a source of deep discontent and resentment for groups like the Houthis and Southern Hirak who saw the proposals undermining their demands for greater autonomy and fairer share of resources.

Against this backdrop, skirmishes between the Houthi militias and Government forces started spreading across the country around June 2014.<sup>7</sup> Capitalizing on the unrest caused initially by the rescinding of fuel subsidies in July and August of 2014, the Houthi militias backed by Saleh forces marched into Sana'a in September of 2014 and gradually took over the government institutions during the first quarter of 2015. This led the incumbent government, including President Hadi to flee and take refuge in the southern port city of Aden and later in Riyadh. The Houthis kept pressing south while a South Arabian led coalition of nine Arab countries initiated a military campaign to restore the ousted government to power.<sup>8</sup> This plunged the country into a civil war that is still ongoing.

### Impact on the Economy

The consequences of war on the socio-economic fabric of the country have been devastating. An already polarized country has deeper divisions today. There has been a large scale destruction of life and property. The economy has contracted sharply since the conflict erupted. Available estimates suggest that real GDP has contracted by 35 percent since late 2014. Enterprises are operating at half the capacity compared to before the conflict. An estimated 8 million Yemenis have seen their livelihoods collapse and are living in communities with minimal to no basic services. Civil service salaries have been paid only partially since

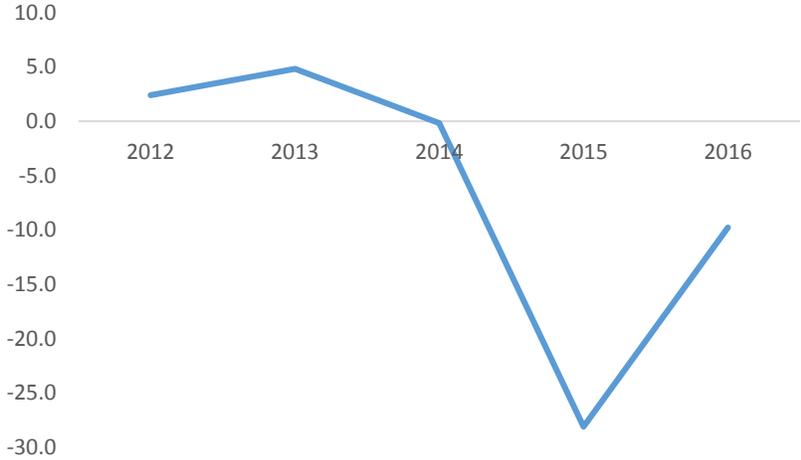
---

<sup>7</sup>The Houthis, also known as "Ansarullah", represent a religious sect named after its founder Hussein Al-Houthi. Based in Sa'adah in the north of the Republic of Yemen, the Houthis had already fought six wars with the central government.

<sup>8</sup> This information is sourced from World Bank (2016). "Country Engagement Note for the Republic of Yemen".

last September 2016 (teachers). Fiscal revenues are weak, deficit financing is increasingly being secured through a build-up of arrears, undermining state functions and impairing the situation for the private sector. The financial sector is facing enormous difficulties with runaway non-performing loans. Oil and gas exports, the main source of revenue and foreign exchange prior to the conflict, have largely dried up. Important economic institutions like the Central Bank of Yemen have been unable to curb runaway inflation.

Figure 2.1: Real Growth in Yemen, 2012-2016



Source: IMF estimates

Box 2.1: Conflict and the Economy- Night Time Lights over Yemen

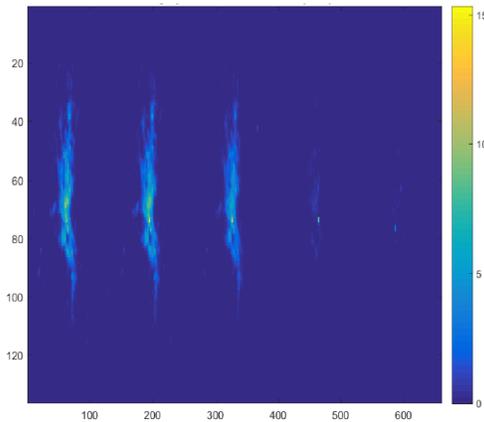
It has now been recognized and accepted that radiance from night-time lights correlates strongly with GDP cross-sectionally with richer countries tending to be brighter, on average. But recent evidence shows even more strikingly that changes in countries' light intensities tend to track annual GDP growth. In other words, there may be a proportional relationship between changes in light intensity and changes in GDP.

This has led to an increasing usage of night-time lights as a proxy for the level of economic activity. In underdeveloped or conflict affected regions in particular, where the availability and reliability of survey or census data at high level of granularity is limited, night-time lights data have become a useful resource. Recent studies have used night-time lights to study the growth of cities in sub-Saharan Africa (Storeygard, 2016), production activity in blockaded Palestinian towns of the West Bank (van der Weide et al, 2015), and urban form in China (Baum-Snow & Turner, 2012) and India (Harari, 2016).

Nighttime lights satellite imagery encompass almost all inhabited areas of the globe, including Yemen, and record the average quantity of light observed at each pixel over a given time period. The Defense Meteorological Satellite Program (DMSP) series offers annual composite images across cloud-free nights for every year, 1992-2012. Pixels are just under 1km North-South and vary from 1/2 to 1km in their East-West width, allowing researchers to study questions at a relatively fine spatial scale worldwide. Since 2012, a new global NTL series has become available at the monthly level, collected by

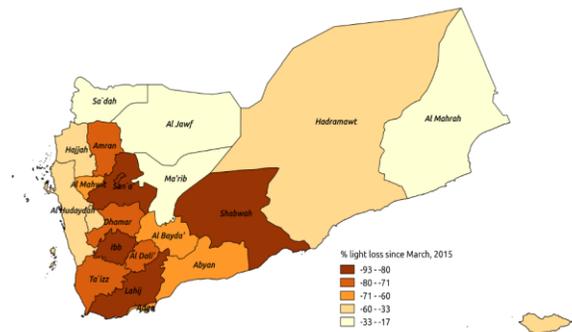
NASA's VIIRS satellite. As described in Elvidge et al (2013), VIIRS is a more powerful and specialized instrument than its DMSP predecessors, enjoying a much higher resolution. The research community has only just begun to explore the potential of VIIRS imagery for tracking economic changes around the world.

(a) VIIRS imagery over Sana'a, January-May 2015



Source: VIIRS, satellite imagery

(b) Light loss by governorate before and after March 2015 (as of August 2015)



Source: World Bank staff estimates based on VIIRS satellite imagery

VIIRS imagery over Sana'a between January-May 2015 shows a precipitous fall in light intensity beginning March 2015 which is the month during which the Saudi air campaign on Sana'a intensified. By April 2015, the light footprint over Sana'a all but disappears. Taking the average light intensity between January 2014 and March 2015 as the base, it is apparent that every governorate experienced a decline in light intensity between April-August. The losses varied by governorates, obviously, with the least affected province (Al-Mahrah) losing 17 percent of its baseline radiance and the more affected governorates of Shabwah, Ibb, Sana'a losing upward of 80 percent. The capital city itself suffered a 93 percent light loss.

What do these light losses imply for the level of economic activity? Using the global lights-GDP elasticity of 0.277 (Henderson, Storeygard and Weil, 2012), it would appear that provincial output loss just in the first few months of conflict among the most affected governorates would range between 22-25 percent.

### The Human Cost

A key question of interest is how the conflict and its consequences on the economy might have affected the lives and livelihoods of the Yemeni population. Beginning in the November 2015 survey round, the Gallup World Poll (GWP) began to inquire whether respondents in Yemen had been affected by the conflict and inquire about their perceptions of the conflict. Of interest to household welfare, respondents were asked a number of questions about the change in their livelihood and assets "as a result of the recent conflict." These responses permit an estimate of the prevalence of particular types of adverse consequences of the conflict. Furthermore, the full GWP questionnaire allows one to track changes in a number of self-reported indices of welfare, and to compare the changes of households whose livelihoods and assets were directly affected by the escalation in conflict to the changes of households whose livelihoods and assets were indirectly affected.

Table 2.1: Conflict Questions in the Gallup World Poll Administered in Yemen in 2015 and 2016

---

*Was your house damaged or destroyed by bombing during the recent conflict in this country?*

*Did your household lose its main source of income as a result of the recent conflict in this country?*

*Did your household have to rely totally on help from others outside your household for food and other basic necessities as a result of the recent conflict in this country?*

*Were you unable to get the financial support you usually receive from people in another country as a result of the recent conflict in this country?*

*Were you displaced from one part of the country to another as a result of the conflict?*

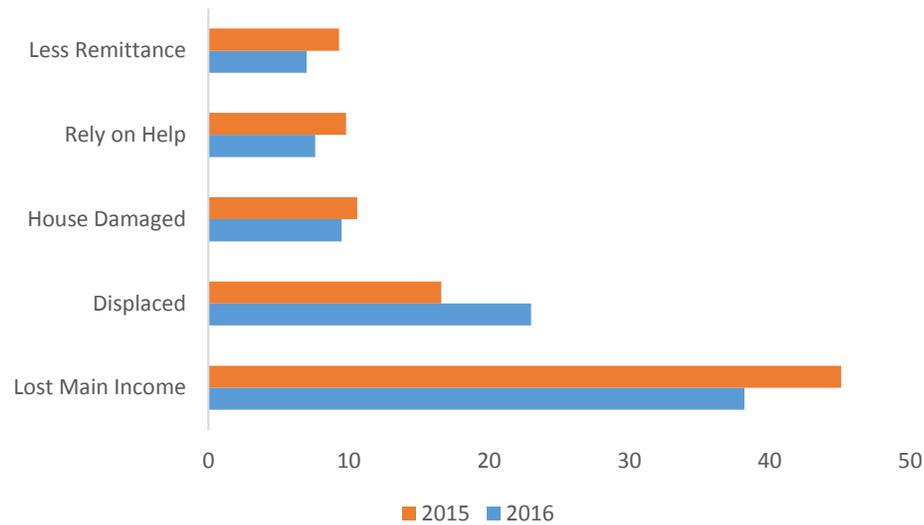
---

Source: Gallup World Poll Questionnaires

Based on the GWP, a large share of the Yemeni population had their livelihood or assets adversely affected due to conflict by November of 2015. Slightly more than 56 percent of the population had responded affirmatively to at least one of the livelihood questions listed in Table 2.1. In 2016, the share of the population that had their livelihood or assets adversely affected remained roughly constant, where slightly more than 53 percent of the population indicated an adverse effect of the conflict. The small decline in the affected population was similar across all questions except for the share of the displaced population, which increased between 2015 and 2016. (Figure 2.2)

The prevalence of households that lost their main source of income was of particular concern for the population in both 2015 and 2016, where approximately 46 percent of households responded affirmatively in 2015 and 38 percent of households responded affirmatively in 2016. Furthermore, nearly 10 percent of households responded affirmatively to each question listed above, suggesting that there were a broad range of ways that household livelihood was affected. Importantly, nearly one quarter of the population reported having been displaced from one part of the country to another by 2016. This latter estimate of displacement is larger in magnitude than the estimate by the TFPM, which found that approximately 11 percent of the population had been displaced by January of 2017, and that 80 percent of these individuals had been displaced for more than a year (TFPM 2017).

Figure 2.2: Loss of Livelihood and Assets by August 2016



Source: World Bank staff calculations based on Gallup World Poll Surveys

However, these dramatic effects of the conflict are not uniform throughout the country, and there are significant variations by governorate. By 2016, four governorates all had over 70 percent of respondents reporting that their livelihood or assets were adversely affected by the conflict; and three governorates had fewer than a quarter of respondents responding affirmatively.

Gallup World Poll also collects information on several subjective measures of well-being. For example, the Financial Life Index and the Food and Shelter Index inquire about the economic well-being of each respondent, such as whether they had enough money to afford necessities. Alternatively, the Daily Experience Index, Negative Experience Index, and Positive Experience Index all track whether individuals had positive, negative, or stressful experiences on the day before the survey. In addition to the individual-specific questions, the survey also collects information about the beliefs the respondent had about the well-being of the economy and the government in the Economic Confidence Index, Job Climate Index, and the National Institutions Index. In all cases aside from the Negative Experience Index, a decline indicates that well-being or perceptions have gotten worse.

Consistent with FAO estimates, welfare had declined dramatically by August of 2016 relative to the levels reported in 2014. Between the 2014 and 2016 rounds of the survey, there was a sharp worsening in nearly all indices that track perceptions and measures of subjective wellbeing. (Table 2.2) Many of these declines are consistent with an increase in households not even being able to afford basic necessities, such as an increase in the share of people who could not afford basic food or shelter (Food and Shelter Index). Furthermore, the worsening of well-being and perceptions was stronger in nearly every instance for individuals whose livelihoods and assets were directly affected by the conflict. However, it is important to note that there was a worsening of self-reported well-being also amongst households whose livelihoods were not reported to have been directly affected by conflict. Thus, on average, the entire population reports to have experienced a decline in welfare, and the FAO estimates of food insecurity might not only be driven by displaced individuals and those who have had their livelihoods dramatically affected by the escalation in conflict (FAO 2016).

Table 2.2: Changes in Subjective Measures of Well Being from Gallup Surveys, 2014-2016

Index Name	2014	2016- Livelihood Directly Affected	2016- Livelihood Indirectly Affected	Change where Livelihood Directly Affected (Column 1 - Column 2)	Change where Livelihood Indirectly Affected (Column 1 - Column 3)
Daily Experience Index	65.7	57.2	68.5	-8.49***	2.80
Economic Confidence Index	-52.2	-80.6	-61.5	-28.4***	-9.30**
Financial Life Index	22.3	9.60	18.3	-12.7***	-4.01***
Food and Shelter Index	72.2	50.9	72.5	-21.2***	0.358
Job Climate Index	16.6	3.67	7.29	-12.9***	-9.31***
National Institutions Index	38.9	29.6	38.4	-9.34***	0.488
Negative Experience Index	28.1	30.1	20.3	1.97	-7.80***
Optimism Index	128.7	18.3	23.5	-110.4***	-105.2***
Positive Experience Index	59.9	44.8	58.4	-15.2***	-1.57

Source: World Bank Staff estimates based on data from Gallup World Poll

## Poverty Projection

To what extent does the deterioration of various dimensions of subjective wellbeing show up in more objective measures? This entails answering questions about how the income/consumption distribution may have changed as a result of the conflict and to determine how the overall size of those below the poverty line may have changed. One key challenge in assessing the impact on poverty and the overall distribution of income is the question of how to project the macroeconomic shocks into the household survey. A simple solution is often to use the growth elasticity of poverty to estimate the impact on poverty. This exercise for Yemen would entail estimating the elasticity, possibly using the 2005 and 2014 estimates of poverty and the corresponding output figures, and applying that elasticity to the growth rates for 2015 and 2016 to arrive at the poverty impact for these outer years.

This is a simple methodology to execute but has some key limitations. First, the elasticity estimates obtained from past relationship between aggregate output and household welfare may not necessarily apply during times of crisis. Second, what one obtains from this method is just a point estimate of what the poverty level would be in the outer years; there is no additional detail on how the event/crisis may have affected the entire distribution.

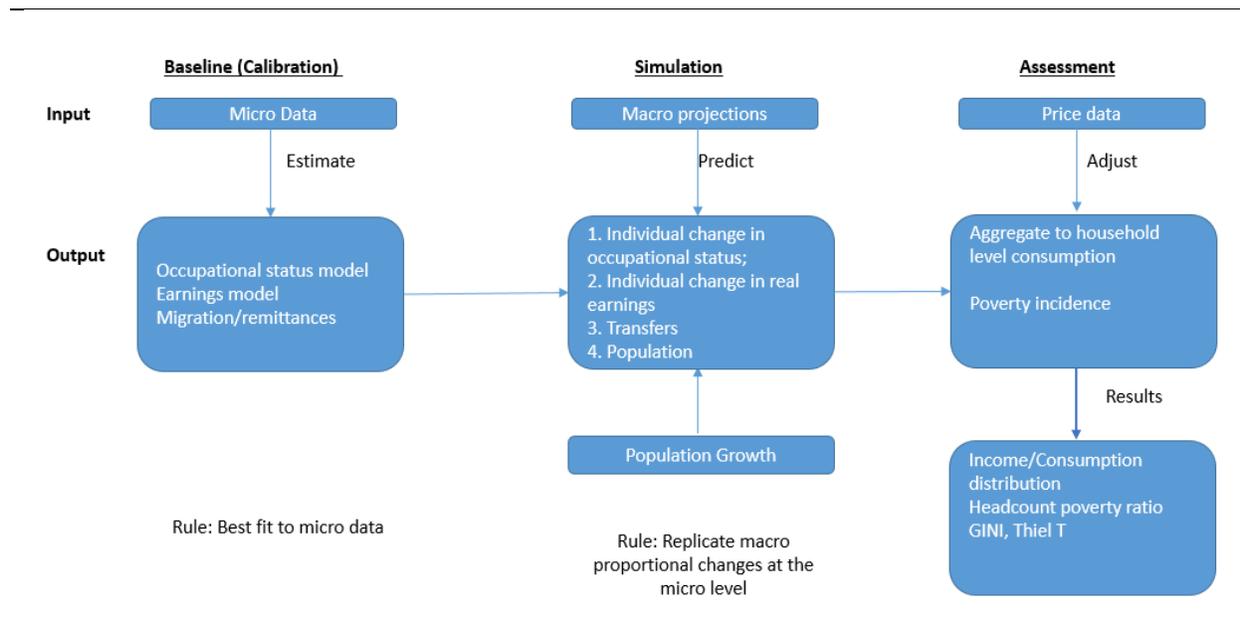
Alternatively, there is a class of micro-simulation models that allows macro projections to be directly superimposed into behavioral models built on household survey data. These models build on the first generation micro-simulation models described in Bourguignon et al (2008) and Ferreira et al (2008) but with an additional simplification of omitting the computable general equilibrium (CGE) component which is often difficult to develop satisfactorily in poor data environments. They have been applied extensively to study ex ante impacts of the 2009 financial crisis in countries such as Bangladesh, Philippines, Mexico, Poland and Mongolia and to specifically study the impact of conflict in Iraq. (see Olivieri et al 2014 and Krishnan and Olivieri, 2016) A particular strength of these models is that they can account for multiple transmission channels and capture the impacts across the income/consumption distribution. For example, these models can accommodate labor market adjustments, adjustment of earnings, public and private transfers also adjustments in the prices of food and non-food commodities during the crisis.

The following subsections describe the microsimulation model adopted for use in Yemen and some key results generated out of the micro-simulation methodology.

### Methodology

The micro-simulation methodology used to project poverty in 2016 is based entirely on Olivieri et al. (2014). As such, the description of that methodology here will draw quite extensively from the technical exposition in the original document. Three key steps of this methodology are: baseline calibration, simulation and assessment of impact. Each of the steps are described in detail below and Figure 2.3 provides a conceptual summary of the overall methodology.

Figure 2.3: Conceptual Summary of the Microsimulation Methodology



Source: Olivieri et al (2014)

The **baseline stage** of this methodology entails the use of household survey information to estimate a set of parameters and unobserved characteristics for various equations of the household income generation model. The theoretical underpinnings of this model come from Bourguignon and Ferreira (2005) and the model allows for the accounting of multiple transmission channels at the individual as well as household level. The first component of the model is an accounting identity that defines household per capita income for any household  $h$  as the ratio of the total household income and the total number of members,  $n_h$ , in that household. In particular,

$$y_h = \frac{1}{n_h} \left[ \sum_{i=1}^{n_h} \sum_{L=1}^{\mu} \sum_{j=0}^J I_{hi}^{Lj} y_{hi}^{Lj} + y_{0h} \right]$$

where,

- $i$  = household member
- $L$  = level of education
- $\mu$  = maximum level of education
- $j$  = labor status
- $J$  = economic sector

$I_{hi}^{Lj}$	= indicator function of labor status $j$ of individual $i$ with level of education $L$
$y_{hi}^{Lj}$	= earnings of individual $i$ with level of education $L$ in economic sector $j$
$y_{0h}$	= total non-labor income received by household $h$

Total household income is essentially the sum of two main sources of income: labor income and non-labor income. Labor income accrues to every household member active in the labor market and is contingent on the skill level as well as the occupation/sector of employment. Total household labor income is an aggregation across all household members. Non-labor income can be income accrued to an individual member or the entire household.

Based on this formulation, the first parameterization that is required is of the individual occupational choice. Data constraints for Yemen restrict the sectoral richness that can be brought to this analysis, so the analysis here is limited to three states: inactive/unemployed or being employed in the agricultural or non-agricultural sector. Ideally, more granularity of the non-agricultural sector would have been desirable but unfortunately the survey questionnaire does not allow for a richer sectoral analysis. Each individual must choose from each of the three labor market states and the unobserved utility determinants of each occupational status are assumed to be identically and independently distributed across all individuals, occupation and skill levels. Skill levels are defined in two mutually exclusive categories with those with education below primary level including primary level considered low skills and those above primary level considered high skills.

The labor market participation or occupational choice model essentially relies on the utility maximization approach developed by McFadden (1974) where every individual chooses the highest level of utility obtained from any given occupational state.

The second parameterization that is required is of the earnings in each sector  $j$ . Here the standard approach is to model earnings as a log-linear function of observed individual and household level characteristics  $X_{hi}^L$  and unobserved factors such as  $\vartheta_{hi}^L$  and that is what is chosen. This is akin to estimating Mincer equations independently for each sector and by skill level. Formally, this can be written as:

$$\log y_{hi}^{Lj} = X_{hi}^L \Delta^{Lj} + \vartheta_{hi}^L \text{ for } i = 1, \dots, n_h \text{ and } j = 1, \dots, J$$

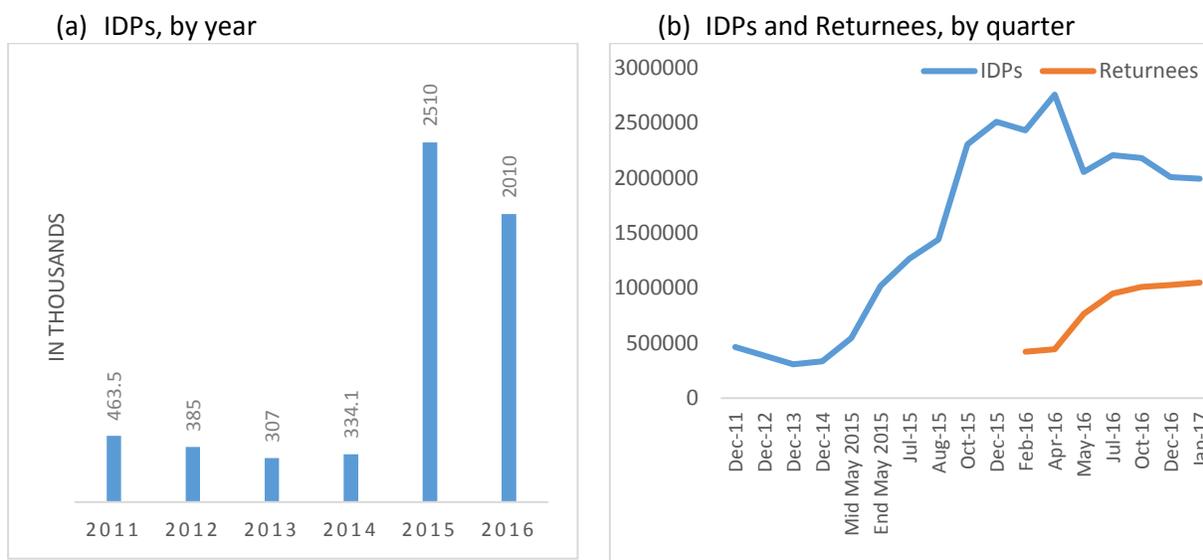
Household non-labor income is a sum of four key components: private transfers or remittances received by the households, social welfare fund (SWF) which is the main transfer program in Yemen, social assistance (includes income through pensions, social assistance in cash and kind, etc), and all other transfers. Remittances accrue as a result of migration decisions which could also be modeled under ideal conditions, but the data that is going to be used for these simulations do not have sufficient information to carry out this modeling. This for this exercise, remittances are regarded as transfers, independent of the choice to actually migrate that may have taken place at an earlier stage.

Once the baseline parameterization of the model is completed, the next step is the **simulation**. This step essentially entails replicating the macro changes in outputs and employment in the household survey data to project it to the outer years. This is done by using the parametrization completed in the earlier stage. The adjustment follows the following sequence. First, the underlying population and its demographic composition needs to be projected from the baseline year (2014) to the simulation year (2016). This is typically done by adjusting the weights on the household survey data by the natural rate of population growth. If population growth projections are available by various regions or demographic groups, then

this level of granularity can be embedded in the population projection. In the simplest case, a single country level population growth estimate is applied to the entire sample and that is what has been done here.

Box 2.2: Incorporating Internal Displacement in the Simulation Model

One key, non-standard consideration in the application of the microsimulation methodology such as the one that is used here to a conflict affected country like Yemen is the issue of internal displacement. Given the prevalence of several low level conflicts in different parts of the country over the last two decades or so, some internal displacement has always been there in contemporary Yemen. But the numbers jumped after 2015 and reaching over 2 million internally displaced people today. That is 7 percent of the population for a country with 27.4 million people.



Source: International Organization for Migration (IOM), Displacement Tracking Matrix

From the perspective of simulating the welfare impact of the conflict, IDPs would appear to be an important consideration to take into account. Krishnan and Olivieri (2016) do that for Iraq and the methodology utilized broadly follows the following logic: use governorate level IDP transition matrix to identify the governorates with most displacement, randomly assign households from the IDP originating governorate to host governorates based on the proportion of IDPs that move to each of those governorates, and assume that IDPs travel just with their portable assets and as such, lose the stream of welfare they would have received from housing and other durable asset ownership. Additionally, IDPs are assumed to lose their labor incomes, except if they were in public sector employment and also their stream of public transfers.

Given the availability of similar data for Yemen, this analysis could also make some strong assumptions and incorporate IDPs into the poverty simulations using a similar methodology. But a decision is made not to do so for the following reasons. First, while the plight of the IDPs is important in its own right from an analytical as well as policy perspective, it is unclear whether incorporating IDP movements improves a point estimate that is already likely to be quite noisily estimated. Second, unlike the case of Iraq between 2012 and 2014 where the source of IDPs are often the IS affected governorates, the

conflict in Yemen is distinctly multi-polar and therefore the movement of people across governorate boundaries represents a complex interplay of a rapidly evolving conflict environment. One manifestation of this is a sizable population of returnees. Modeling displacement and returns simultaneously will introduce additional complexity in return for a payoff that is not necessarily clear cut. An additional complexity is added by the fact that, 42 percent of the estimated of the IDP population is actually displaced within the same governorate, which is the smallest geographic unit for which the survey is representative. Annex 2 presents some additional details on population movements within Yemen between 2014 and 2016.

The rest of the simulation proceeds broadly as follows. Using the predictions of the behavioral model – particularly the occupational choice model – the output shock and the implied changes in overall employment in each of the sectors of the macro economy are transmitted to the household. In particular, for each household, the changes in income due to the shock depends on the demographic structure, the employment elasticity of output in the sector in which the household members are employed and the associated earnings changes within the sector. Changes in non-labor income are typically modeled to increase or decrease at different rates under different assumed scenarios while personal transfers are modeled to track changes in the projected overall growth rate. For the application to Yemen here, various scenario assumptions are made for the different components of non-labor income.

The final step of the micro-simulation is the **assessment** and in this step, based on the information on the employment status, earnings and non-labor income, a simulated income distribution is generated. This in turn is then used to calculate various poverty and distributional measures under various scenarios. In the case of Yemen, since poverty is calculated using consumption as the welfare measure, the final step consists of taking the average consumption/income ratio in the baseline sample to retrieve the simulated consumption distribution. Since the simulation is done using real growth rates applied to the baseline year, the generated consumption distribution is also expressed in the base year local currency. This implies that the poverty line calculated in 2014 prices can be applied to the new consumption distribution to obtain the new, simulated poverty rate. This assumes however, that the food and non-food CPI broadly change in the same manner between 2014 and 2016. If this assumption is violated and the food CPI outstrips the general CPI, then the value of the baseline poverty line may not be sufficient for households to meet their basic food requirements in the projected year. In this case, a special adjustment to the baseline poverty line is required. Available data on food and non-food CPI for Yemen post-2014 suggest that in fact food prices may not have grown faster than non-food commodity prices. (See Annex 1 Table 2A.2)

## Results

This section highlights the results of the application of this methodology for Yemen. As discussed earlier, Yemen witnessed a significant drop in its GDP between 2014 and 2016. The exact breakdown of the decline between agriculture and non-agricultural sector is presented in Table 2.3. Overall GDP is estimated to have shrunk cumulatively by about 35 percent between 2014 and 2016. Both agriculture and non-agricultural sector, which is composed to a large extent by Yemen's hydrocarbon sector, have been hit hard with the non-agricultural sector suffering a slightly larger contraction.

Table 2.3: Real GDP Growth Estimates for 2015 and 2016, Yemen

	2014-2015	2015-2016	2014-2016
Overall	-28.1%	-9.8%	-35.1%
Agricultural	-25.0%	-6.0%	-29.5%
Non-agricultural	-28.8%	-10.7%	-36.5%

Source: IMF staff estimates

Using historical data on overall output in agriculture and non-agricultural sector for Yemen, the output elasticity of employment for both sectors is estimated. These elasticity numbers contain information of the structural relationship between overall employment and output levels in each of the two sectors for Yemen and in particular, they summarize how much employment can be expected to change as a result of, say, a percentage change in output for each of these sectors. These elasticity estimates are then used to calculate the overall employment rate as well as the employment composition between the two sectors.

Table 2.4: Overall Employment by Sectors and Estimated Post-Conflict Changes

	Relative Employment					
			Shares		Employment rate, 15+	
	2014 Baseline	2016 Estimated	2014 Baseline	2016 Estimated	2014 Baseline	2016 Estimated
Agriculture	1,927,643	1,955,365	33.5%	45.9%		
Non-agriculture	3,825,790	2,308,886	66.5%	54.1%		
Inactive/Unemployed	11,561,080	13,918,497				
Total	17,314,513	18,182,748			0.384	0.271

Source: World Bank Staff estimates based on HBS 2014 and WDI data

Table 2.4 presents information on the total working age population that is employed in agriculture, employed in non-agriculture, and inactive or unemployed in the baseline as well as the crisis impact year, 2016. The distinction between the unemployed and the inactive population is because the survey data doesn't collect enough information to distinguish between the two states. The overall size of the labor force is predicted to grow as a consequence of population growth, and the growth in the size of labor market entrants. As a result of the contraction of economic activity, overall employment rates decline from 38 percent in the baseline year to 27 percent in 2016. This 11 percentage point decline in overall employment is also accompanied by an increase in employment in lower productivity agricultural sectors and a decrease in overall employment in the non-agricultural sector. Inactive/unemployed share of the population increases from 11.6 million in 2014 to 13.9 percent in 2016.

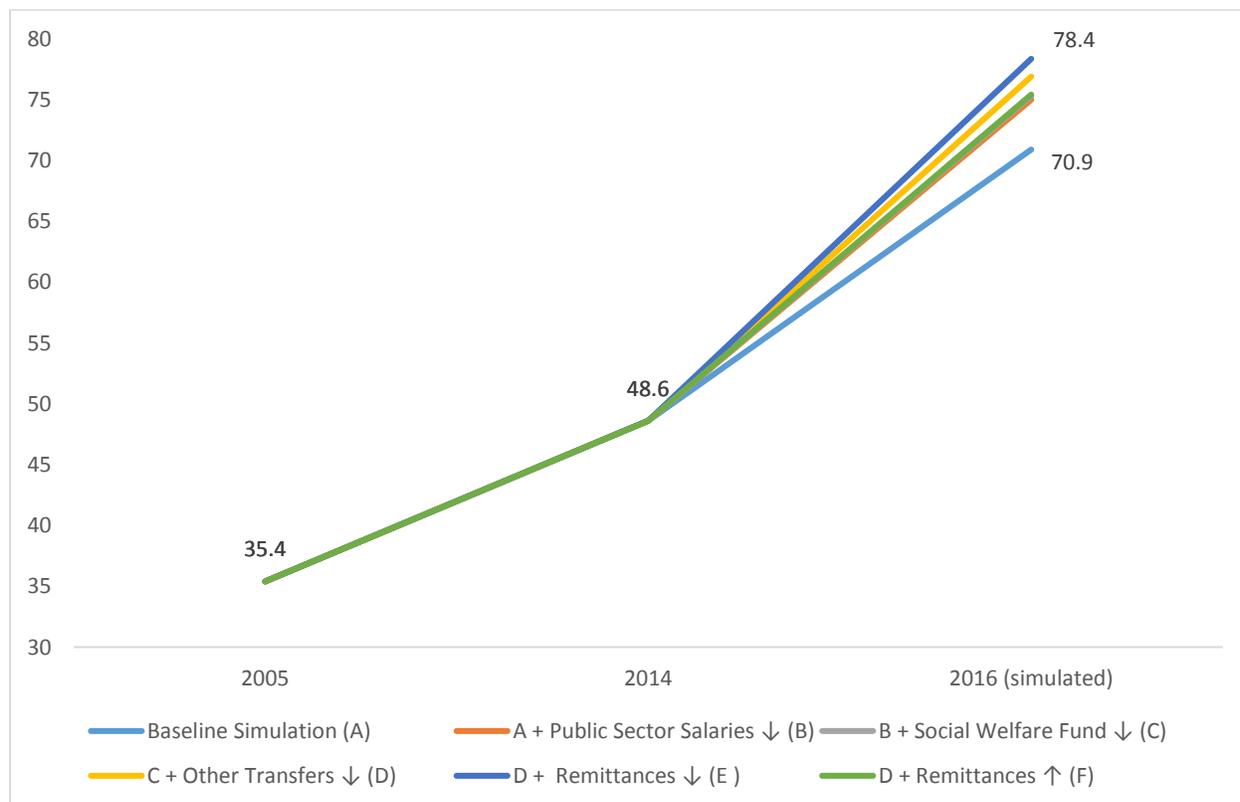
These aggregate changes are incorporated in the simulation model by reassigning the occupational status of individuals based on the estimated probabilities of being in each of the occupations. This is done by first running a multinomial occupational choice model and using the predicted probabilities to rank individuals in each of the states. Based on this ranking, individuals with the lowest probability of being in any state of employment are reassigned to the inactive/unemployed group until the overall employment rate in the household survey sample matches the employment rate for the entire economy. In the following step, a similar procedure is followed to reassign individuals from the non-agricultural sectors of employment to the agricultural sector until the sectoral employment numbers in the survey sample match the macro-aggregates. Individuals employed in non-agricultural sectors in the baseline can either be

inactive/unemployed or move into agriculture. But individuals who were in agriculture can only be unemployed or inactive; they cannot move to a higher productivity non-agricultural sector in the crisis year.

In the next step, for individuals whose sector of employment ends up being reassigned in the simulations, income from employment in the new sector needs to be determined. This is done by using estimated parameters of a Mincer equation for earnings in each of the sectors. Individuals who are inactive/unemployed earn zero labor income. For non-labor income, different components are assumed to provide a certain fraction of income the households were getting under different scenarios. Overall income for the entire household is recalculated by aggregating over all individual labor earnings (taking into account employment/sectoral reassignments and any non-labor income the household may receive). This is then converted into overall household consumption using the estimated consumption-to-income ratio from the baseline data.

Note that public sector workers are not included in the reassignment described above. The assumption is that public sector workers enjoy a greater job security and are less likely to lose their job entirely or be employed in another sector. Thus labor income for public sector workers regarded almost as non-labor income for the simulation purpose and shocks are modeled as modulated increase or decrease in overall annual income. The results in Figure 2.4 shows the projected poverty depending on different assumptions on public sector employee salaries and non-labor income.

Figure 2.4: Poverty Trend in Yemen Using Simulated Results for 2016 (% of population)



Source: World Bank staff calculations using HBS 2005/06 and HBS 2014

The baseline simulation represents the scenario in which non-labor incomes and the income of public sector workers remains unchanged and all the impact on poverty comes from the labor earnings described by the microsimulation model above. It is noteworthy that this alone causes estimated poverty in 2016 to jump by roughly 21 percentage points to 70.9 percent. In the second scenario, in addition to this baseline, public sector wages and salaries are adjusted to 75 percent of their annual levels in 2014. This amount is consistent with reports from the country that salaries have not been paid since September 2016. For the year 2016, this would imply a 25 percent reduction in wages/salaries. This causes the headcount poverty rate to jump to 75 percent of the population. In addition, if the household only receives 75 percent of social welfare fund along with the decrease in public sector salaries than the poverty rate would increase to 75.3 percent. This suggests that even though a large fraction of population receives social welfare funds the amount they receive is quite low and this is indeed confirmed also from the results from Chapter 4. The other main source of income is remittances. During times of economic distress, remittances flows from household members that reside in other parts of the country (or in other countries) can increase to compensate for loss in income from other sources. However, if the shock is covariate in nature (as opposed to idiosyncratic) and affects the economic circumstances for the migrant worker as well, then his/her ability to remit more may be limited as well. Naturally, depending on which effect dominates, remittances could play a mitigating or exacerbating role. (Scenarios E and F).

Under scenario D, which is the one with employment and labor market adjustments affecting labor earnings, public sector salaries and all public transfers at 75 percent of their 2014 and remittances remaining at the 2014 levels, the headcount poverty rate is predicted to rise to 76.9 percent in 2016. This is a substantial increase from the 48.6 estimated for 2014 in the baseline year. This implies that the number of poor could have grown by as much as 8 million, from about 13 million to 21 million between 2014 and 2016. The poverty gap and severity measures too jump quite substantially suggesting that the poor are likely to be more deeply mired in poverty in 2016. Aggregate inequality is likely to have increased with the Gini going from 36.7 to 48.9. This suggests that the crisis in the Republic of Yemen has not only made people worse off but has had a disproportionately larger effect on the poor and vulnerable. (Table 2.5)

Table 2.5: Simulated Poverty and Inequality Changes in Yemen, 2014-2016

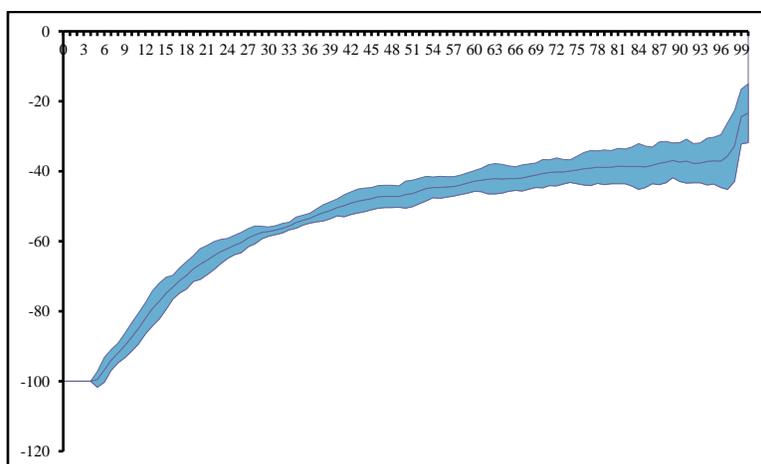
		2014 (actual)	2016 (simulated)
Poverty	Headcount	48.6	76.9
	Poverty Gap	15.5	43.7
	Severity	6.7	30.1
Inequality	Gini	36.7	48.9
	Theil L	22.2	50.0
	Theil T	25.5	50.1

Source: World Bank staff calculations using HBS 2014 and simulated data

This point is further reinforced by the growth incidence curve calculated between 2014 and 2016 and presented in Figure 2.5. Examining the growth rate of per-capita household consumption by percentile, it is evident that while households across the consumption distribution experienced a reduction, the declines are sharper for those at the lower end of the distribution. This is in a way unsurprising because

the reliance on labor income – which is the channel that appears to have been the most affected as a result of the ongoing – is higher among the poorer households.

Figure 2.5: Growth Incidence Curve between 2014 and 2016



Source: World Bank staff calculations using HBS 2014 and simulated data for 2016

### Validation

How accurately do the results from this microsimulation exercise represent Yemen’s reality in 2016? There are several important considerations pertaining to the quality of the underlying data and the reasonableness of the assumptions underpinning the methodology. First, the estimated behavioral models that capture structural relationships between household and individual characteristics and labor market outcomes generate parameter estimates that may be valid for the earlier “normal period” but it is not clear that these would hold during times of conflict and economic upheavals. One simple example of this is the consumption to income ratio. In order to translate the simulated income into the space of consumption – which is the welfare aggregate over which poverty is measured in Yemen – one has to use a consumption-to-income ratio calculated out of the baseline data in 2014. Will this ratio calculated during a normal year be the same during a period of higher economic distress? Perhaps not, but the argument is that at least it has the benefit of being transparent and simple.

Second, the models of the kind used here are partial equilibrium models which are unable to account for adjustment of the economy through, for example the changes in relative prices. An example is food prices. If, say, as a result of conflict food prices increase, then these models are designed to capture the impact on consumers of food. The fact that the food price increases are also a terms of trade improvements for the producers of agricultural commodities who may respond to higher prices by producing more and thereby mitigating the impact on the poor who might benefit from higher wages and profits in agriculture or a less-than-expected increase in food prices are the kind of effects that these models do not incorporate. The microsimulation models also do not allow for mobility of factors (labor and capital) across space and are thus static in that regard.

But these are limitations that apply to the general class of ex-ante microsimulations and the spirit of this specific application is to provide some analytical underpinning to extrapolate Yemen’s poverty trend to 2016. Triangulation with other sources of information coming out Yemen suggests that at least the headline numbers may not be too far off the mark. For example, the recently concluded Humanitarian

Needs Overview exercise for Yemen estimates 18.8 million in need of dire humanitarian assistance out of total population of 27.4 million. That is around 69 percent of the population. Likewise, as per FAO's most recent estimates, close to 65 percent of the Yemeni population is experiencing food insecurity and the country is at the brink of a famine. Contrasted against these numbers, the simulated poverty rates do not appear to be particularly high as income poor are often a larger group than those in urgent need of humanitarian relief or food aid. More directly, if one is to use the most accepted global growth-elasticity of poverty number of -2, a 35 percent reduction in per capita GDP between 2014 and 2016 would imply a poverty to 83 percent in 2016.<sup>9</sup>

Looking at sources of income of the Yemeni population, own labor emerges an important source of income for all Yemenis, and marginally more so for the poorer ones. (Table 2.6). Labor income constitutes about 80 percent of total income for those in rural areas and a slightly lower 78 percent in urban areas. Correspondingly, Yemenis living in urban areas and who are non-poor source a slightly higher fraction of their income from non-labor sources. Social welfare fund (SWF) as a fraction of total non-labor income higher in rural areas. SWF is a bigger share of non-labor income for poorer households. For households in the poorest quintile the share of SWF in non-labor income is around 25 percent compared to only 7 percent for the richest quintile. Within labor income, there is a greater reliance on wage employment in urban areas possibly due to a higher availability of wage jobs in urban areas. Conversely, rural areas are likely to have a higher self-employment activity. Given this large reliance on labor employment, the decline in economic activities and the resulting erosion of livelihoods to the extent that has been witnessed in Yemen could plausibly have led to the rise in poverty to levels reported here.

Table 2.6: Income shares by various income categories

	Wage as a share of labor Income	Labor Income share in Total Income	Non Labor income share in Total Income	SWF as share of Non-labor Income
Urban	70.4	78.1	21.9	10.6
Rural	58.5	79.8	20.2	20.0
Non Poor	60.4	78.1	21.9	11.7
Poor	63.7	80.6	19.4	23.0
Poorest Quintile	65.3	80.4	19.6	25.4
2	63.3	79.3	20.7	22.9
3	60.3	81.4	18.6	16.4
4	61.6	78.6	21.4	14.1
Richest Quintile	59.6	76.8	23.2	7.2

Source: World Bank staff calculations based on data from HBS 2014

Another way of carrying out what is perhaps a quasi-validation utilizes a unique feature of the baseline data of 2014. Although the current conflict in Yemen truly escalated with the Saudi and other coalition

<sup>9</sup> There is considerable cross-country heterogeneity in the estimates of growth-elasticity in poverty and the -2 number is the one that was reported in "Attacking Poverty, World Development Report 2000/01" produced by the World Bank.

forces entering the fray in March 2015, there were some low level skirmishes already ongoing in several parts of the country even in 2014, when the Yemen Household Budget Survey data was being collected. The Houthi march on and capture of the capital city Sana'a in September of 2014 was one such event. This was a culmination of anti-government protests that began in the city at the end of August, and continued through mid-September. Clashes and a 4-day siege of the city by Houthi rebels began on September 16, after which the capital was under Houthi control.<sup>10</sup>

An important feature of the Household Budget Survey (HBS) is that a decent number of households in Sana'a were interviewed both before and right after the siege. In particular, 757 households were surveyed prior to the capture of the city, and 231 households were surveyed after the siege had concluded. This allows for the investigation of changes in household welfare in response to the capture of the city, which was, again, a small portion of the conflict and instability Yemen has witnessed in the last few years. Moreover, by comparing this change in welfare before and after September 2014 with the change in average welfare before and September of the earlier survey round in 2005/06, can help rule out seasonal factors that might affect welfare and yield an arguably better estimate of what welfare would have looked like without the capture of the capital.

The results of this exercise are presented in Table 2.7 below. Following the capture of the city, household expenditure declined and the share of individuals who were poor increased. When comparing these changes to the changes over the same time period in 2005, that the decline in welfare was large. In particular, expenditure decreased by 22 percent relative to 2005, and poverty increased by 8.8 percent. During the same period and in the rest of Yemen however, one cannot rule out the possibility of no changes in expenditure and poverty.

Table 2.7: Change in Expenditure and Poverty Following the Capture of Sana'a by Region

	Sana'a (City)		Rest of Yemen	
	Percentage Increase in Expenditure	Increase in Poverty	Percentage Increase in Expenditure	Increase in Poverty
Change after the capture of Sana'a-2014	-0.141	0.043	0.006	-0.048
Change over Same Period-2005	0.082	-0.045	0.053	-0.071
Difference-in-Difference	-0.224***	0.088**	-0.047	0.024

Source: World Bank Staff calculations using HBS 2005/06 and HBS 2014

In addition to total household expenditure and poverty, the impact of the siege was also felt on other broader measures of well-being. In particular, calorie consumption declined, the average prevalence of nutrient deficiencies increased, wages declined, and the reported share of days for which electricity was available also declined.<sup>11</sup> (Table 2.8) All of these estimates suggest that there was a sizeable decline in welfare in Sana'a following the capture of the city, just post the Houthi siege. An important caveat again with the methodology here is that it is unable to identify the underlying mechanism through which conflict

<sup>10</sup> See Al Jazeera (Accessed March 2017): <http://america.aljazeera.com/articles/2014/9/25/houthi-yemen-takeover.html>.

<sup>11</sup> For food consumption, the sample was restricted to households for which the detailed dates for the diary was reported

may be affecting welfare. For example, is the drop directly due to violence, a disruption of services, or a combination of both?

Table 2.8: Change in Other Welfare Measures Following the Capture of Sana’a, 2014

	Percentage Increase in Calorie Consumption	Increase in the Average Prevalence of Nutrient Deficiencies	Percentage Increase in Wages	Increase in Share of Days Electricity is Available
Change after the capture of Sana’a-2014	-0.249	0.087	-0.146	-0.005
Change over Same Period-2005	0.005	-0.012	0.161	0.001
Difference-in-Difference	-0.255**	0.099**	-0.307***	-0.007*

Source: World Bank Staff calculations using HBS 2014

It is difficult to generalize these estimates for Sana’a city to arrive at a precise estimate of the changes in welfare following the escalation in conflict in 2015 for the entire country. But these results do provide some way of anchoring the results of the simulations presented above to some concrete numbers obtained from within the sample. They also provide some measure of confidence that the impacts on welfare would be larger when accumulated over a longer 2-year period between 2015 and 2016 when the conflict escalated and spread across the country. This would also be consistent with results from the Gallup World Poll estimates showing that both a large share of households had their livelihood and assets adversely affected by the conflict and that there were substantial declines in welfare indices amongst all households in 2015 and 2016.

## Conclusion

This chapter makes an effort to extrapolate Yemen’s poverty trend from 2014 to 2016 using a microsimulation methodology. The microsimulation takes into account the impact of the economic collapse on available labor market opportunities (employment as well as earnings), the partial non-payment of public sector salaries and other public transfers such as those through the Social Welfare Fund – Yemen’s flagship social assistance program. Results suggest that headcount poverty rates in 2016 could have surged as high as 77 percent. In terms of number of poor, this translates to 21 million and is 8 million higher than the number of poor estimated from the Household Budget Survey of 2014. The results also suggest a significant increase in the depth as well as severity of poverty in 2016.

## References

- Baum-Snow, N. M. Turner (2012) "Transportation and the Decentralization of Chinese Cities" Brown University working paper
- Bourguignon, F. and F. Ferreira (2003). "Ex-ante evaluation of policy reforms using behavioral models" in *The Impact of Economic Policies on Poverty and Income Distribution*, eds. Bourguignon, F. and Pereira da Silva, L., World Bank-Oxford University Press.
- Bourguignon, F. and F. Ferreira (2005). "Decomposing Changes in the Distribution of Household Incomes: Methodological Aspects" in *The microeconomics of income distribution dynamics in East Asia and Latin America*, eds. Bourguignon, F., Ferreira, F., and Lustig, N., Washington DC: Oxford University Press and The World Bank.
- Bourguignon, F., M. Bussolo and L. Pereira da Silva (2008). "The impact of macroeconomic policies on poverty and income distribution: macro-micro evaluation techniques and tools", in *The Impact of Macroeconomic Policies on poverty and Income Distribution*, eds. Bourguignon, F., Bussolo, M. and Pereira da Silva, L. The World Bank, Washington, DC.
- Elvidge, Christopher, K. E. Baugh, Mikhail Zhizhin, Feng-Chi Hsu (2013). "Why VIIRS Data are Superior to DMSP for Mapping Nighttime Lights". *Proceedings fo the Asia-Pacific Advanced Network*. 35(2013)
- Ferreira, F., P. Leite, L. Pereira da Silva and P. Picchetti (2008). "Can the Distributional Impacts of Macroeconomic Shocks Be Predicted? A Comparison on Top-Down Macro-Micro Models with Historical Data for Brazil" in *The impact of macroeconomic policies on poverty and income distribution: macro-micro evaluation techniques and tools*, eds. Bourguignon, F., M. Bussolo, and L. Pereira da Silva. The World Bank, Washington, DC.
- FAO. 2016. "Emergency Food Security and Nutrition Assessment." Technical Report, Rome.
- Harari, Mariaflavia (2016). "Cities in Bad Shape: Urban Geometry in India" Working paper
- Henderson, V. A. Storeygard and D. Weil (2012). "Measuring Economic Growth from Outer Space". *American Economic Review* 102 pp 994-1028
- Krishnan, N. and S. Olivieri (2016), "Losing the Gains of the Past: The Welfare and Distributional Impacts of the Twin Crises in Iraq 2014", Policy Research Working Paper 7567
- MacFadden, D. (1974) "Conditional Logit Analysis of Qualitative Choice Behavior" in Paul Zarembka, ed., *Frontiers in Econometrics*. New York, Academic Press.
- Mincer, J (1974) "Schooling, experience and earnings" New York: Columbia University Press for NBER.
- Olivieri, S., Kolenikov, S., Radyakin, S., Lokshin, M, Narayan, A and Sanchez-Paramo, C (2014), "Simulating Distributional Impacts of Macro-Dynamics: Theory and applications", World Bank, Washington, DC.
- Task Force on Population and Movement. 2017. "TFPM- 12'th Report." Joint task force of UNHCR and IOM, January.

## Annex

### Annex 1

Table 2A. 1: Elasticity of Employment to Output

	Employment, 2004	Employment, 2010	% change	Output, 2004	Output, 2010	% change	Elasticity
Agriculture	1340101	1324040	-0.012	59877	74597	0.246	-0.049
Non Agriculture	2982805	4020364	0.348	238883	315371	0.320	1.086

*Source:* World Bank staff calculations using WDI data

Table 2A. 2: Change prices for key consumption commodities

Category	CPI changes between December 2015 and December 2016
Food and non-alcoholic beverages	10%
Cigarettes, tobacco and qat	28%
Clothing and footwear	8%
Housing, water, electricity, gas and other	9%
Furnishings and household equipment	-4%
Medical services	3%
Transport	19%
Communications	3%
Education	15%
Hotels and restaurants	19%

*Source:* Correspondence with the Yemen CSO

Table 2A 3: Governorate Level Headcount Poverty Rates, 2014 and 2016

Governorate	2016 (simulated)	2014a	2014
Ibb	86.5	56.7	56.6
Abyan	76.6	48.8	48.6
Sanaa City	43.1	13.2	13.4
Al-Baida	69.4	39.2	39.2
Taiz	79.0	41.5	41.4
Al-Jawf	89.3	55.4	55.4
Hajja	88.2	63.8	63.9
Al-Hodeida	81.5	58.2	58.1
Hadramout	85.1	60.8	60.6
Dhamar	67.6	31.1	31.1
Shabwah	72.4	42.1	42.1
Saadah	94.7	84.3	84.5
Sanaa Region	78.5	42.0	42.1
Aden	51.8	22.1	22.2
Laheg	89.1	69.1	69.1
Mareb	55.3	24.1	25.9
Al-Mahweet	86.2	60.7	60.7
Al-Maharh	78.2	58.0	57.8
Amran	91.1	76.6	75.9
Al-Dhale	89.6	59.9	59.8
Remah	78.4	49.5	49.5
Socatra	72.4	49.5	50.1
Total	76.9	48.6	48.6
N	9292	9292	9376

Note: World Bank staff calculations using HBS 2014 and simulated data. 2014a column refers to governorate level headcount poverty rates when the households whose post simulation per capita consumption is missing is dropped. 2014b refers to the full sample governorate level headcount poverty rates for Yemen for 2014.

Table 2A.4: Multinomial- High Skill Level

VARIABLES	Agriculture	Non Agriculture
Age	0.159*** (0.025)	0.265*** (0.018)
Age squared	-0.002*** (0.000)	-0.004*** (0.000)
Years education	0.044** (0.021)	0.092*** (0.014)
Urban	-1.951*** (0.153)	0.097 (0.072)
Household size	-0.006 (0.011)	-0.013** (0.006)
Other hh member in public sector	0.894*** (0.095)	-0.148** (0.060)
Enrolled in school	-0.664*** (0.152)	-1.111*** (0.081)
Dependency ratio	-0.541** (0.229)	-0.129 (0.152)
1.sex	5.536*** (1.454)	2.002*** (0.093)
1.head	8.032*** (1.632)	0.852** (0.337)
1.sex#1.head	-4.845*** (1.633)	0.069 (0.340)
1.remit	-1.666 (1.074)	0.068 (0.140)
1.sex#1.remit	1.704 (1.078)	0.208 (0.153)
Constant	-11.292*** (1.531)	-7.736*** (0.331)
Observations	12,673	12,673

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: World Bank staff calculations using HBS 2014

Table 2A.5: Multinomial- Low Skill Level

VARIABLES	Agriculture	Non Agriculture
Age	0.032*** (0.008)	0.086*** (0.009)
Age squared	-0.000*** (0.000)	-0.001*** (0.000)
Years of education	0.011 (0.008)	0.047*** (0.007)
Urban	-1.624*** (0.102)	0.347*** (0.061)
Household size	-0.004 (0.006)	-0.031*** (0.006)
Other hh member in public sector	0.141** (0.072)	-0.376*** (0.068)
Enrolled in school	-1.358*** (0.192)	-2.323*** (0.140)
Dependency ratio	-0.096 (0.111)	-0.207* (0.112)
Sex	2.862*** (0.134)	3.134*** (0.085)
Household head	4.128*** (0.138)	0.988*** (0.181)
1.sex#1.head	-1.792*** (0.152)	-0.130 (0.185)
Gets remittance	0.027 (0.121)	-0.375*** (0.138)
1.sex#1.remit	-0.085 (0.134)	0.385*** (0.147)
Constant	-5.272*** (0.224)	-4.414*** (0.193)
Observations	28,273	28,273

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: World Bank staff calculations using HBS 2014

Table 2A.6: Earnings Equation Agriculture

VARIABLES	High Skill	Low Skill
Years of education	0.027 (0.023)	-0.010 (0.011)
Urban	0.491** (0.211)	0.295* (0.159)
Sex	-2.221 (3.966)	0.219 (1.039)
Household head	-3.487* (1.895)	-0.202 (0.270)
1.sex#1.household_head	2.818 (1.904)	-0.419 (0.307)
Owens land	0.700*** (0.130)	0.603*** (0.212)
1.sex#1.own_land		-0.148 (0.221)
Constant	13.219*** (4.046)	11.401*** (0.994)
Observations	884	2,567
R-squared	0.329	0.240
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Note: World Bank staff calculations using HBS 2014. Earnings equations is derived only for agriculture as there are no individuals that move from agriculture to non-agriculture in the occupational choice model.

## Annex 2: Internally Displaced Persons (IDPs)

Table 2A.7 shows the information on origin and destination of IDPs for each governorate. Sana'a, Hajjah, Sa'ada, and Taizz account for the majority of origin of IDPs in Yemen. A large number of IDPs are within the governorates. Nationally 42 percent of the IDPs are displaced within the same governorates. Taizz, Sa'ada, and Hajjah have large number of IDPs who are displaced within the governorates. Sana'a Region, Amran, Dhamar, Hajjah, Ibb, and Sana'a received the majority of the IDPs who moved across governorates. Adding the individuals displaced within governorate and individuals who moved to across governorates, Hajjah, Taizz, Sana'a Region, Al Hudaydah, Amran, Dhamar, Ibb, Saada, and Sanaa have more than hundred thousand IDPs each. This number has reduced in recently due to an increase of returnees.

Table 2A.7: IDPs by Governorates

	IDPs Originating	Displaced within	From Outside	Total IDP's in Gov
Abyan	10500	1164	11826	12990
Aden	44964	660	35574	36234
Al Bayda	32136	15012	18048	33060
Al Dhale'e	17424	7488	20208	27696
Al Hudaydah	60630	11994	92994	104988
Al Jawf	48432	29148	9642	38790
Al Maharah	330	6	3258	3264
Al Mahwit	2796	372	44136	44508
Sana'a Region	312378	13896	151878	165774
Amran	49380	26952	122676	149628
Dhamar	21738	17028	124854	141882
Hadramaut	10638	2442	9888	12330
Hajjah	376704	264900	141024	405924
Ibb	15606	5886	128610	134496
Lahj	32928	24936	32706	57642
Marib	41436	20682	30096	50778
Raymah	1188	198	51714	51912
Sa'ada	310398	103404	168	103572
Sana'a	95490	32556	107580	140136
Shabwah	13722	9228	7944	17172
Socotra	2334	2310	0	2310
Taizz	504960	258120	12906	271026

Source: Yemen: Task Force on Population Movement 13<sup>th</sup> Report Annex 1, IOM and UNHCR March 2017

Table 2A.8 below shows the net change in population across the different governorates due to the movement of people because of conflict. The population has decreased in large absolute numbers for Sana'a region, Sa'ada, and Taizz. Governorates like Amran, Dhamar, and Ibb have seen an increase in their population.

Table 2A.8: Change in Population by Governorates

	Population Net change	Estimated Population 2016	Adjusted Estimated Population 2016
Abyan	2490	560781	563271
Aden	-8730	876877	868147
Al Bayda	924	748410	749334
Al Dhale'e	10272	686799	697071
Al Hudaydah	44358	3047620	3091978
Al Jawf	-9642	579684	570042
Al Maharah	2934	139670	142604
Al Mahwit	41712	675247	716959
Sana'a Region	-146604	1149916	1003312
Amran	100248	1063804	1164052
Dhamar	120144	1849317	1969461
Hadramaut	1692	1436607	1438299
Hajjah	29220	2057247	2086467
Ibb	118890	2792353	2911243
Lahj	24714	962989	987703
Marib	9342	321346	330688
Raymah	50724	547129	597853
Sa'ada	-206826	1024948	818122
Sana'a	44646	2961539	3006185
Shabwah	3450	620640	624090
Socotra	-24	46136	46112
Taizz	-233934	3133652	2899718

Source: Yemen: Task Force on Population Movement 13<sup>th</sup> Report Annex 1, IOM and UNHCR March 2017

To better understand the movement of IDPs across governorates, the Table 2A.9 below shows the full matrix of IDPs. Analyzing the four largest governorates (Taizz, Sa'ada, Hajja, and Sana'a region) according to the origin of IDPs show that a large fraction of IDPs tend to stay within the governorate expect for Sana'a region where they moved to Sana'a.

Table 2A.9: Origin and Destination of IDPs in Yemen

Govern	Abyan	Aden	Al Bayda	Al Dhale'e	Al Hidaydah	Al Jawf	Al Maharah	Al Mahwit	Sana'a Region	Amran	Dhamar	Hadramaut	Hajjah	Ibb	Lahj	Marib	Raymah	Sa'ada	Sana'a	Shabwah	Socotra	Taizz	IDPs Total
Abyan	1164	2658	774	12	1866	0	0	0	1608	0	0	120	6	150	384	12	0	0	258	168	0	3810	12990
Aden	1458	660	5196	54	426	0	0	0	0	0	6	0	0	30	1524	0	0	0	144	300	0	26436	36234
Al Bayda	684	594	15012	876	846	30	0	0	6774	210	444	342	1368	564	78	450	0	336	738	360	0	3354	33060
Al Dhale'e	60	4704	108	7488	96	0	0	6	9630	12	18	12	0	666	1050	78	0	108	306	48	0	3306	27696
Al Hidaydah	324	2298	36	294	11994	180	12	156	1530	72	138	78	70902	90	300	360	42	2808	1626	48	0	11700	104988
Al Jawf	0	0	0	0	0	29148	0	0	3552	426	0	0	0	0	0	534	0	5034	96	0	0	0	38790
Al Maharah	798	576	24	30	192	0	6	0	192	54	18	6	24	60	282	12	0	0	18	108	0	864	3264
Al Mahwit	0	216	12	36	10020	48	12	372	23016	378	18	24	3306	12	30	330	0	1386	4146	42	0	1104	44508
Sana'a Region	270	1560	1014	420	3270	5406	0	1542	13896	4080	498	126	9738	2100	228	5118	168	46830	14358	18	0	55134	165774
Amran	126	510	42	12	2136	2592	0	156	41064	26952	30	222	13428	240	0	906	0	51558	6024	24	0	3606	149628
Dhamar	390	8358	2292	864	10116	204	144	108	45300	1236	17028	2154	5028	2850	1272	1104	108	5634	10818	1206	0	25668	141882
Hadramaut	1482	3378	90	12	192	2268	0	0	294	0	30	2442	96	0	60	24	0	666	366	210	24	696	12330
Hajjah	54	936	102	0	6222	54	0	138	28740	10776	198	246	264900	42	18	264	0	81276	8400	96	0	3462	405924
Ibb	1422	7338	2478	6228	2034	522	102	0	22140	600	792	3090	2424	5886	1746	1674	18	1974	2904	936	0	70188	134496
Lahj	258	4866	2664	180	174	0	0	0	1740	0	18	30	0	12	24936	6	0	72	426	120	0	22140	57642
Marib	0	48	600	192	576	6792	0	6	3774	978	726	0	288	1674	0	20682	642	1692	10272	516	0	1320	50778
Raymah	504	2220	834	396	8190	168	54	48	20310	1494	1524	132	3372	300	66	606	198	2982	2004	252	0	6258	51912
Sa'ada	0	0	0	0	0	24	0	0	0	144	0	0	0	0	0	0	0	103404	0	0	0	0	103572
Sana'a	90	192	432	150	1656	918	0	264	79140	1860	174	6	1620	756	234	8670	12	4626	32556	6	0	6774	140136
Shabwah	1368	1656	420	60	264	78	0	0	474	54	18	1590	90	168	66	600	0	6	12	9228	0	1020	17172
Socotra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2310	0	2310
Taizz	48	2196	6	120	360	0	0	0	9204	54	60	18	114	6	654	6	0	6	18	36	0	258120	271026
Origin Total	10500	44964	32136	17424	60630	48432	330	2796	312378	49380	21738	10638	376704	15606	32928	41436	1188	310398	95490	13722	2334	504960	2006112

Source: Yemen: Task Force on Population Movement 13<sup>th</sup> Report Annex 1, IOM and UNHCR March 2017

## Chapter 3 : Food and Nutrition Security in Yemen, 2005-2014<sup>12</sup>

### Introduction

Yemen experienced a substantial increase in poverty between 2005 and 2014. This chapter is devoted to describing access to food in 2014, and analyzing changes in food access between 2005 and 2014. The goal of the chapter is to better understand how households coped with the decline in the standard of living, and whether access to food declined.

Analysis of food consumption patterns necessitates estimating the nutritional content of reported quantities of particular foods consumed. However, as in many developing countries, the share of the diet that is consumed outside the household and the share of the diet composed of processed food categories for which it is difficult to infer nutritional content have been increasing over the past decade. Thus, it is necessary to utilize potentially imprecise estimates of nutrient consumption for a significant share of total household consumption. However, a number of different estimation strategies are pursued, and despite this ambiguity, the results highlighted below are robust to utilizing all plausible estimation strategies.

This chapter is structured as follows. Section 2 describes the lack of adequate food access amongst a large share of the population in 2014, and presents evidence that suggests that food access dramatically declined in 2015 and 2016 from its already tenuous state in 2014. Section 3 describes how access to a diet adequate for an active and healthy lifestyle declined between 2005 and 2014, corroborating the substantial increase in poverty during the time period. Section 4 presents estimates of how households responded to a number of strong shocks that occurred in 2014. And Section 5 summarizes the main results and concludes.

### Access to Food in Yemen, 2014

A large share of individuals did not have adequate access to food in 2014. Approximately 10.8 million Yemenis did not meet their estimated minimum daily energy requirement (MDER), which translated to approximately 41 percent of the population.<sup>13,14</sup> Furthermore, approximately 21 percent of the population had a severe energy shortfall of over 25 percent. For an individual requiring 2100 daily calories, a shortfall of this severity would translate to consumption of less than 1575 daily calories. This high incidence of undernourishment, which was corroborated by other estimates using both similar and

---

<sup>12</sup> Primary author: Sharad Alan Tandon

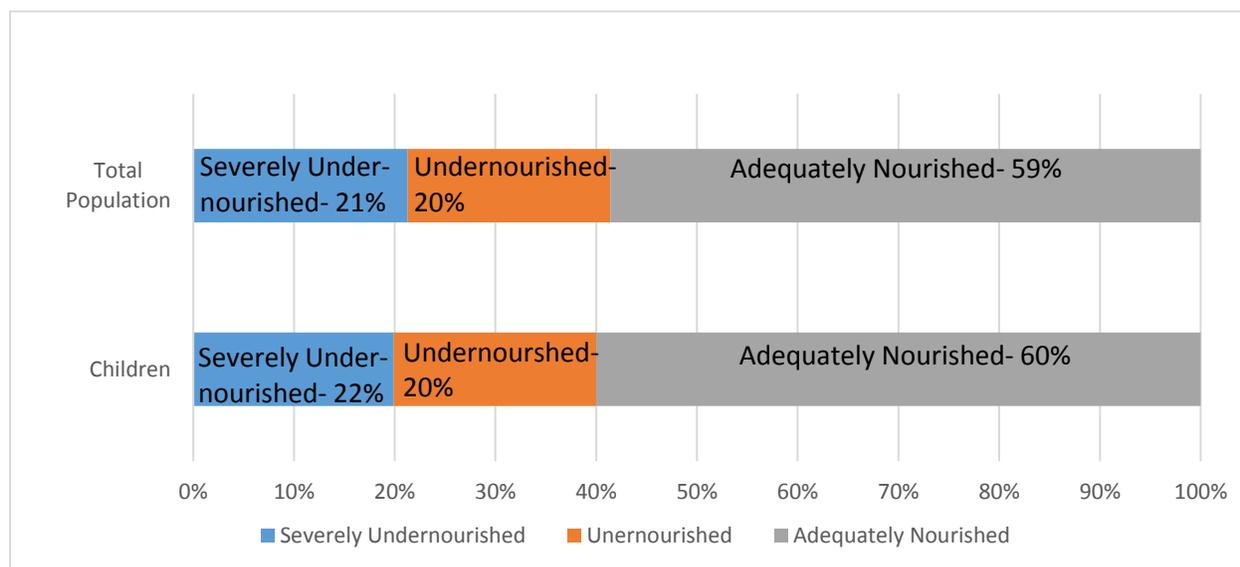
<sup>13</sup> Average calories and nutrients contained per gram of each food item on the menu list of the HBS was obtained from the USDA National Nutrient Database for Standard Reference (accessed March 2017): <https://www.ars.usda.gov/northeast-area/beltsville-md/beltsville-human-nutrition-research-center/nutrient-data-laboratory/docs/usda-national-nutrient-database-for-standard-reference/>.

<sup>14</sup> MDER's were estimated using FAO (2001), which are based on age, gender, activity level, and BMI. Although BMI's were not available in the HBS surveys, it is assumed that all individuals are moderately active and have BMI's roughly equal to the same reference weight and height for each age and gender group used by the Institute of Medicine of the National Academies (2006) in the estimation of Estimated Average Requirements (EAR's) for nutrient consumption.

different methodologies, was one of the highest in the world and has persisted with little improvement since 1990 (e.g., WFP 2012; Von Grebmer et al. 2013; FAO 2014; Rosen et al. 2014; etc.).

This high prevalence of undernourishment in the overall population was qualitatively identical to the prevalence of undernourishment amongst all children and amongst children under four. Undernutrition has particularly strong impacts on children given the role proper nutrition plays in cognitive development, long-term health, and even survival (e.g., Von Grebner et al. 2013). These effects are further compounded by the fact that the schooling and the development of human capital that occurs during youth is of poorer quality for children suffering from poor health and undernutrition (e.g., Glewwe and Miguel 2008). The high proportion of children that lacked access to an adequate diet suggests that a large share of the young Yemeni population could struggle to develop adequate human capital to lead a productive life, and future welfare outcomes might continue to be affected by the poor state of food access in 2014.<sup>15</sup>

Figure 3.1: Undernourishment in 2014



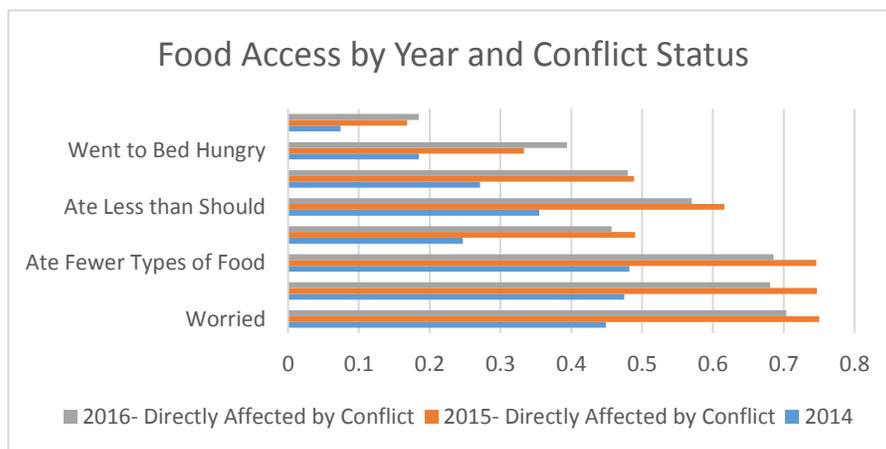
Source: World Bank Staff calculations using data from HBS 2014

<sup>15</sup> This framework assumes that food is distributed equitably in the household and the children receive the same share of food as their share of the total household dietary requirement. However, this assumption might not be valid, and there is evidence of inequitable distribution of food within households. In particular, in a number of African countries, a substantial share of undernourished children actually reside in non-poor households (e.g., Brown et al. 2017).

Box 3.1: Food Security in the Gallup World Poll After the Escalation of Conflict

Following the 2014 HBS, there was a significant escalation of conflict beginning in 2015 that had dramatically affected welfare (e.g., FAO 2016). In order to better understand how food security changed following the 2014 HBS, one can utilize the Gallup World Poll (GWP). The GWP conducted surveys in Yemen both before and after the escalation of conflict. In addition to asking a number of questions about peoples’ subjective welfare, the 2015 and 2016 surveys inquired in detail about food security status and whether households had their assets or livelihood affected by the conflict in a number of possible ways. In particular, the survey inquired if households had their house damaged, lost their main income source, relied on financial support from others, were not able to obtain normal forms of support, and if households were displaced from one part of the country to another.

The estimates in the GWP suggest that the poor food access reported in the 2014 HBS significantly declined following the escalation of conflict, and this response was strongest for the 56 and 53 percent of the population who reported to have their income or assets adversely affected by the conflict in 2015 and 2016 respectively. The share of respondents reporting food insecurity increased for all food security questions, including the most severe forms of food insecurity associated with extreme undernourishment (e.g., going the whole day without food). These numbers have likely even increased since the salaries of many public sector employees have not been paid since the end of the Gallup survey conducted in 2016.

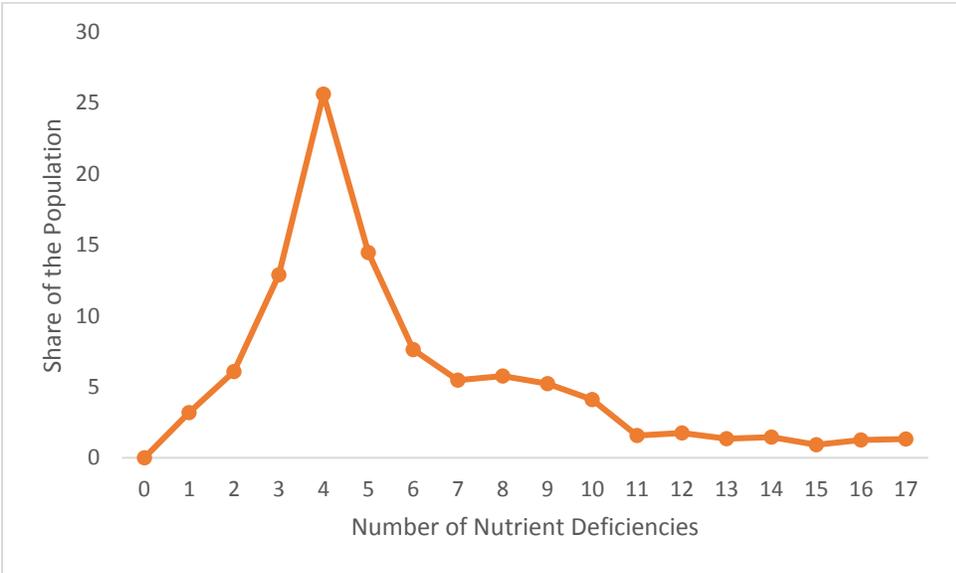


Furthermore, the two most prevalent manners in which the conflict directly affected peoples’ livelihood and assets was either through losing their main source of income (45 percent of the population in 2015 and 38 percent in 2016) or being displaced from one part of the country to another (17 percent of the population in 2015 and 23 percent in 2016). These two risk actors were also particularly associated with extreme coping strategies. Individuals that responded affirmatively to losing their main income source or being displaced due to conflict had reported significantly more food insecurity than individuals who reported having their assets and livelihood affected in other ways, such as having one’s house damaged due to conflict, or losing a normal form of support due to conflict.

In addition to the high prevalence of undernourishment, nutrient deficiency was also widespread. The median household did not meet Estimated Average Requirements (EAR's) for 5 out of 17 nutrients for which the Institute of Medicine of the National Academies reports EAR's by age and gender, and nearly 19 percent of the population did not meet EAR's for more than half of all 17 available nutrients.<sup>16</sup> These patterns help corroborate the high poverty rate in 2014.

Furthermore, micronutrient deficiency, also known as hidden hunger, was widespread in 2014. Although micronutrient deficiencies do not result in hunger, there are significant adverse effects, including cognitive impairment, poor health, and low productivity (e.g., Von Grebmer et al. 2013). Of particular importance are the estimated 87.6 percent of the population that consumed less than their EAR for Vitamin A (associated with visual impairment, increased risk of common infections, increased risk of death), and the estimated 27.1 percent of the population that consumed less than their EAR for Zinc (associated with weakened immune system, more frequent infections, and stunting). Alternatively, most households consumed above their EAR for Iron (associated with anemia, impaired cognitive development, increased risk of maternal mortality, and low energy), where the share of households consuming less than their EAR was estimated to be under 4 percent.

Figure 3.2: Share of the Population by Number of Nutrient Deficiencies



Source: World Bank Staff calculations using data from HBS 2014

<sup>16</sup> EAR's of nutrient consumption were estimated using Institute of Medicine of the National Academies (2006).

### Box 3.2: How is food insecurity defined?

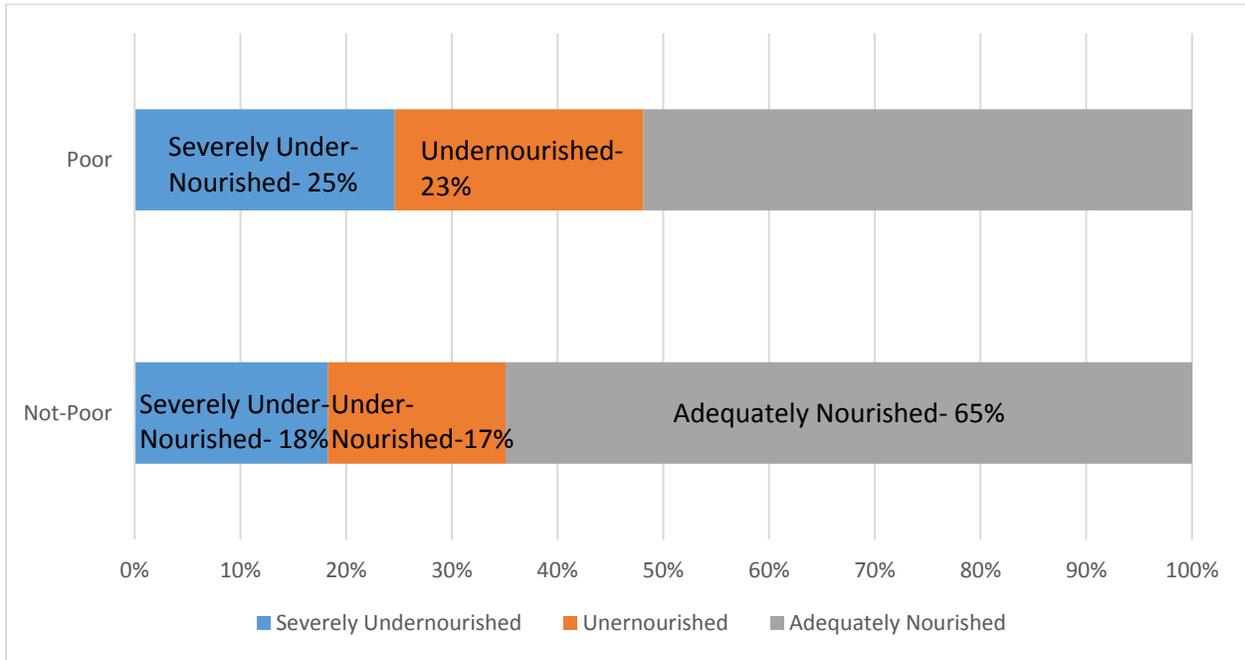
According to the 1996 Food Summit at the Food and Agriculture Organization (FAO), food security exists if and only if “all people at all times have physical, social, and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” Based on the 1996 statement regarding food security, policymakers and researchers have focused on four dimensions of food security:

- Availability: there is a sufficient quantity of food available for the entire population
- Access: each person has economic and physical access to both a sufficient quantity and quality of calories
- Utilization: each person is able to translate a proper diet into healthy outcomes, which further requires adequate sanitation and proper food preparation
- Stability: each of these conditions are met at each point in time

These dimensions are hierarchal, where food availability is necessary for food access, and food access is necessary for food utilization. Stability is the ability to sustain each of the other dimensions over time. (e.g., Webb et al. 2006; Upton et al. 2016; etc.). Given all these dimensions, the concept of food security is not easy to measure or describe in a single indicator. Rather, there are a number of different metrics that help to describe the prevalence of food insecurity that are can be used together to provide a more complete assessment of food security (e.g., Coates 2013). In this chapter, all metrics discussed describe the food access dimension.

This high prevalence of undernourishment and nutrient deficiencies was a problem for both poor and non-poor individuals. Although poor households had significantly less access to food, over 30 percent of non-poor households failed to meet their estimated MDER and nearly 20 percent of non-poor households were estimated to be severely undernourished. Furthermore, non-poor households still have deficiencies in approximately 5 out of the 17 nutritional categories. These estimates all suggest that food access- both access to total calories and access to nutrient-dense calories- was a significant issue for both poor and non-poor households. Furthermore, the fact that such a high share of non-poor households had difficulty accessing food suggests there could have been non-income constraints to obtaining an adequate diet to maintain a healthy lifestyle, such as a problem with food availability.

Figure 3.3: Undernourishment by Poverty Status

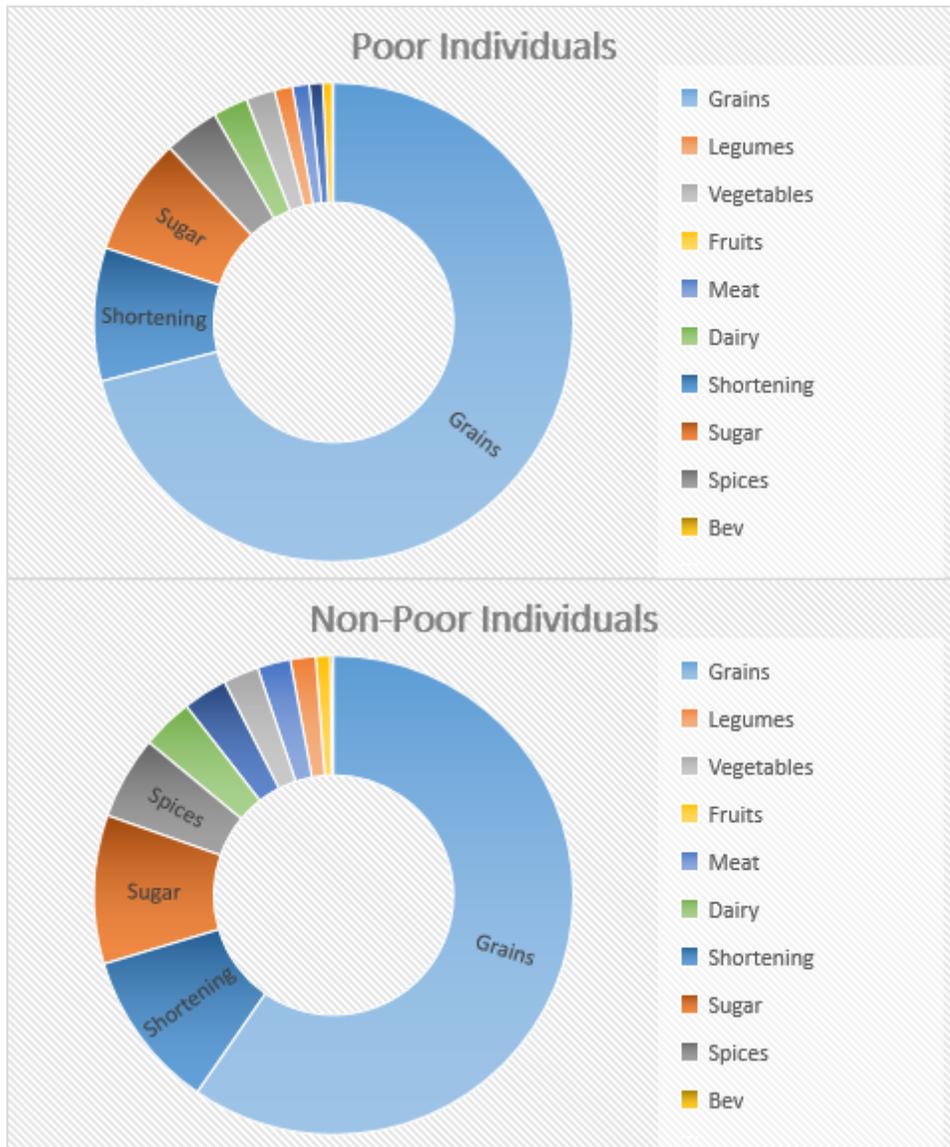


Source: World Bank Staff calculations using HBS 2014

The composition of consumption further suggests that even non-poor households struggled with poor access to high quality foods. Figure 3.4 demonstrates that total calorie consumption for both the poor and non-poor was mostly composed of grains and food categories that are less dense with nutrients than fruits, vegetables, meat, and dairy. Calories from grains accounted for approximately 69 percent of total consumption amongst poor households, and approximately 58 percent amongst non-poor households. Furthermore, consumption from the least nutrient dense food categories- grains, shortening, and sugar- accounted for approximately 87 percent of consumption amongst poor households, and approximately 79 percent of consumption amongst non-poor households. These consumption patterns corroborate the high prevalence of micronutrient deficiencies, and help further corroborate the high poverty rate in 2014.

However, it is important to note that a sizeable share of total food expenditure was devoted to food items for which it is difficult to estimate nutritional content (e.g., snacks, food outside the home, etc.). In 2014, households spent an average of 2852 riyals on these food categories over a two-week period, which was approximately 11.4 percent of total food expenditures. Estimates of calories and nutrients consumed in these difficult-to-observe food categories were based on the average calories and nutrients consumed per riyal spent on more observable food items. In particular, the estimation strategy used in the baseline estimates presented throughout these sections assumes a higher estimate of calories and nutrients in these food categories than has been used in other contexts (e.g., Subramanian and Deaton 1996), but still finds that approximately 10.8 million Yemenis were estimated to be undernourished. Although it is difficult to precisely estimate calories and nutrients from these sources, all estimates highlighted in these sections are robust to utilizing any plausible estimation strategy.

Figure 3.4: Composition of Consumption



Source: Source: World Bank staff calculations HBS 2014

All of these broad patterns of undernourishment in the 2014 HBS were roughly consistent with the estimates in the World Food Programme’s (WFP) (2012) assessment of food security in Yemen, where 44 percent of households were estimated to be food insecure. The WFP assessment was conducted utilizing a household survey, surveys of local markets, and interviews during focus groups. The WFP assessment defined food security using a Food Consumption Score, which was based on diet diversity and evidence of household coping strategies. The numbers are nearly identical to the 2014 HBS estimates of the share of undernourished individuals despite significant differences between the measures, and despite the fact

that food prices continued to decline between 2012 and 2014 as the global 2011 spike in food prices continued to recede.<sup>17</sup>

### Box 3.3: Uncertainty in Estimates of Food Consumption

Estimates of consumption, the prevalence of undernourishment, and the prevalence of nutrient deficiencies are subject to uncertainty. First, as mentioned earlier in the section, a significant share of food expenditures was devoted to food items for which it is difficult to estimate nutritional content. Estimates of nutrients contained in these relatively unobservable sources followed Subramanian and Deaton (1996). Specifically, it is assumed that for each riyal spent on unobservable categories, households received the same average calories and nutrients per riyal on observable categories, less a markup for potential processing fees and other costs. All estimates that are presented in the main text are those that assume a markup of zero (Subramanian and Deaton 1996 assumes a markup of 50 percent), which suggests that the above estimates describing very poor food access could be an overestimate of total consumption.

In addition to the large share total food expenditure devoted to difficult-to-observe food categories, there is further uncertainty regarding each individual's nutritional requirements. We utilize FAO (2001) and Institute of Medicine of the National Academies (2006) to derive broad estimates of nutritional requirements of each individual household member based on age and gender. However, the requirements depend on both the BMI and the activity level of each individual, which is unobservable. Rather, we assume individuals of each gender and age category have the representative body weight and height assumed in Institute of Medicine (2006), and further assume that each individual is moderately active to arrive at estimated nutritional requirements for each household. However, if there were above or below-average weights, heights, or activity levels, the requirements might be imprecisely estimated. Furthermore, we cannot observe pregnancy and lactation status in both the HBS's conducted in 2005 and 2014, and this further introduces measurement error into the nutritional requirements for a subset of households.

### Changes in Consumption between 2005 and 2014

Access to higher quality foods in Yemen likely declined between 2005 and 2014. Given the significant share of total food expenditure devoted to consumption outside the household and to difficult-to-measure food categories, it is difficult to exactly estimate how consumption changed between 2005 and 2014. However, even when utilizing an estimate that is likely an overestimate of total food consumption (Subramanian and Deaton 1996), the average prevalence of nutrient deficiencies across the 17 nutrients for which the Institute of Medicine reports EAR's was higher in 2014 than in 2005 (34 percent versus 29 percent). Furthermore, using this likely overestimate of consumption, the prevalence of nutrient

---

<sup>17</sup> IMF commodity prices were obtained at (accessed March 2017): <http://www.imf.org/external/np/res/commod/index.aspx>. The FAO Food Price Index was obtained at (accessed March 2017): <http://www.fao.org/worldfoodsituation/foodpricesindex/en/>.

deficiencies was statistically higher at conventional significance levels for 12 out of 17 available nutrients, statistically indistinguishable for 3 nutrients, and statistically lower for only 2 nutrients. Given the higher nutrient consumption and the lower prevalence of nutrient deficiencies in 2005 than in 2014 under a wide range of assumptions, it is likely that the quality of diets declined during the time period.

This decline in diet quality between 2005 and 2014 was similar amongst poor and non-poor households, but slightly more robust amongst poor households. The average increase in the prevalence of nutrient deficiencies in 2014 relative to 2005 was similar when comparing the increase for poor and non-poor households (.051 higher and .029 higher for poor and non-poor individuals respectively). Additionally, the share of individual nutrients for which the 2014 prevalence was statistically higher was identical for both poor and non-poor individuals.

Although the changes in diet quality were similar between poor and non-poor households, the most disadvantaged in 2005 had smaller declines in diet quality than the groups that were relatively better off in 2005. In particular, households that were not led by female widowers, households where the household head was not absent for any part of the year, and households where the head did not have a disability all observed larger increases in the number of nutrient deficiencies between 2005 and 2014. Of households who belonged to groups that were more disadvantaged in 2005, they either had small increases in the number of nutrient deficiencies, or one cannot reject the hypothesis that there was no change at conventional significance levels.

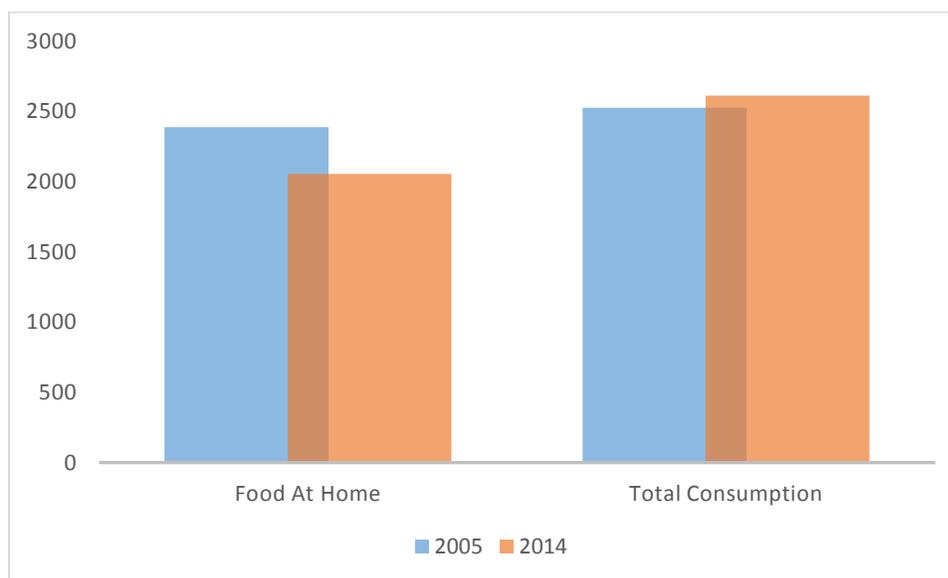
Table 3.1: Changes in Depth of Nutrient Deficiencies by Disadvantaged Status

	Number of nutrient deficiencies		
	Household led by female widower	Household head absent for part of the year	Household head has a disability
Difference for disadvantaged households between 2005 and 2014	0.257	0.264***	0.534***
Difference for non-disadvantaged households between 2005 and 2014	0.863***	.985***	.783***
Difference-in-Difference	-0.606**	-0.721***	-0.249

Source: World Bank staff calculations using HBS 2005/06 and HBS 2014

However, it is possible that overall calorie consumption did not change during this time period. When utilizing only food consumed at home, calorie consumption significantly declined in 2014. Alternatively, when accounting for the higher amounts of estimated consumption of difficult-to-measure categories in 2014, the baseline estimate of calorie consumption and the prevalence of undernourishment were roughly equal in the two time periods. But it is important to note that when utilizing other plausible assumptions to estimate calories contained in processed foods and difficult-to-measure food items, there could have been a decrease in total calorie consumption between 2005 and 2014.

Figure 3.5: Per Capita Consumption by Type of Estimate



Source: World Bank staff calculations using HBS 2005/06 and HBS 2014

The decline in diet quality, despite the possibility that calorie consumption remained relatively constant, corroborates the significant increase in poverty. In many contexts, it has been demonstrated that households sacrifice the quality of their diet in response to adverse economic shocks, but oftentimes do not decrease total calorie consumption (e.g., Block et al. 2004; Brinkman et al. 2009; D’Souza and Jolliffe 2012; D’Souza and Jolliffe 2014; etc.). This is consistent with households substituting towards cheaper and less nutrient-dense foods as a means to avoid hunger more so than micronutrient deficiency. Although this coping strategy likely minimizes physical discomfort and allows people to participate in the labor market, the costs of hidden hunger are large and the revealed choice of households sacrificing nutrient consumption are consistent with a significant decline in the standard of living between 2005 and 2014.

In addition to the decline in diet quality, households made other changes to their food consumption. As discussed in the section outlining poverty measurement in Yemen, the price that individuals paid per calorie declined between 2005 and 2014 despite FAO and IMF estimates showing that world food prices rose.<sup>18</sup> Although the value of the Riyal dropped by approximately 19 percent between 2005 and 2014<sup>19</sup>, the price per calorie declined by more than the decline in the value of the Riyal. This decline was evident for all food categories except for fruits, where there was a significant increase. Households likely consumed lower quality food items in response to a decline in welfare, and this potential substitution towards lower quality food goods might have helped households maintain consumption levels in the presence of declining household expenditure.

<sup>18</sup> IMF commodity prices were obtained at (accessed March 2017): <http://www.imf.org/external/np/res/commod/index.aspx>. The FAO Food Price Index was obtained at (accessed March 2017): <http://www.fao.org/worldfoodsituation/foodpricesindex/en/>.

<sup>19</sup> IMF exchange rates were obtained at (accessed March 2017): [https://www.imf.org/external/np/fin/data/param\\_rms\\_mth.aspx](https://www.imf.org/external/np/fin/data/param_rms_mth.aspx).

Given this substitution towards lower quality food goods, food consumption became more unobservable in 2014 than 2005. As discussed above, there are a number of food items that are difficult to attach a precise estimate of nutritional value. Expenditure on these types of food items were similar in 2005 and 2014, where per capita daily expenditure was 22.6 riyals and 26.3 riyals respectively. However, with the significant drop in the price per calorie, the implied amount of calories purchased significantly increased during the time period. This rise in difficult-to-measure consumption is consistent with household consumption patterns in other developing countries (e.g., Deaton and Dreze 2009).

Importantly, this increase in unobservable food consumption was an important source of calories for both poor and non-poor households. Poor households increased their per capita daily expenditure between 2005 and 2014 by 41 percent (9.7 riyals to 13.8), and increased their implied consumption in difficult-to-measure categories by 297 percent using the High Consumption estimate (100 calories to 397). Thus, the uncertainty over what exactly is being consumed is growing for all types of households, including those with poor access to food.

### Household Resilience in the Face of Shocks

During the 2014 HBS, individuals were subject to a number of strong shocks and policy changes that challenged their ability to maintain adequate access to food. There were shocks that affected the entire country, such as possible seasonal swings due to Ramadan and the removal of a large fuel subsidy that helped support both fuel and non-fuel consumption; and there were location-specific shocks, such as possible seasonality due to agriculture and the Houthi capture of the Sana'a in September. Utilizing both the 2014 and 2005 HBS, one is able to better understand the extent to which this tumultuous time period might have contributed to the poor diet quality of Yemeni households.

First, the prevalence of undernourishment and nutrient deficiencies reported in Sections 1 and 2 could include strong seasonal changes in areas with arable land. In particular, there are three governorates for which there are strong improvements in diet quality between the first and second quarters in both 2005 and 2014<sup>20</sup>, which could be related to planting seasons.<sup>21</sup> These changes were further driven by rural areas, there was little difference in diet quality in urban areas in both years, and there was little evidence of this pattern changing between 2005 and 2014 in rural areas.<sup>22</sup> Alternatively, there was not strong evidence of a consistent seasonal effect between the first and second quarter for other regions of the country. Importantly, this does not rule out the possibility of large seasonal changes in other regions where harvest seasons might differ. However, due to a large policy change and a number of other shocks that began to occur at the beginning of the third quarter of 2014, it is more difficult to discern seasonal patterns in consumption during other quarters of the year.

---

<sup>20</sup> The governorates were Al-Dhale, Hajja, and Mareb.

<sup>21</sup> See FAO (Accessed April 2017): <http://www.fao.org/ag/agp/agpc/doc/counprof/yemen/yemen.htm>.

<sup>22</sup> The 2005 HBS was conducted between April 2005 and March 2006, whereas the 2014 HBS was conducted between January 2014 and December 2014. Thus, in the 2014 survey, the difference between the first and second quarters was in the same calendar year. In the 2005 survey, consumption in the first quarter of 2006 is compared to consumption in the second quarter of 2005. Given the passage of three-quarters of a year, a portion of the 2005 difference could also be attributed to other shocks over time. However, the lack of a difference-in-difference suggests that other shocks over the course of 2005 could be small.

Despite the variability of the policy environment in the third and fourth quarters, there are also swings evident in food availability due to Ramadan. Average calorie consumption and the average number of nutrient deficiencies both improved during Ramadan in 2005 and 2014, and one cannot reject the hypothesis of no difference in the changes in the two years. This increase in consumption during the period is similar to other contexts (e.g., Jolliffe and Serajuddin 2015). Thus, given the seasonality in consumption potentially driven by agriculture and Ramadan, it is likely that a larger share of the population had poor food availability at some point in the year than the prevalence discussed in Section

Table 3.2: Potential Seasonality in Food Availability

	Number of Nutrient Deficiencies- Al-Dhale, Hajja, and Mareb	Number of Nutrient Deficiencies- Rural Households in Al-Dhale, Hajja, and Mareb	Number of Nutrient Deficiencies- Urban Households in Al-Dhale, Hajja, and Mareb		Average Calorie Consumption- Entire Country	Number of Nutrient Deficiencies- Entire Country
Change between Quarters 1 and 2- 2014	-0.961**	-1.17**	0.202	Increase During Ramadan- 2014	239.2***	-0.617***
Change between Quarters 1 and 2- 2005	-1.06***	-1.18***	0.310	Increase During Ramadan- 2005	159.6***	-0.464***
Difference- in- Difference	0.099	0.009	-0.108	Difference- in- Difference	79.6	-0.153

Source: World Bank staff calculations using HBS 2005/06 and HBS 2014

In addition to the seasonality that likely affects Yemen in all years, as noted above, there were a number of unusually strong shocks that occurred during 2014. Arguably, the most important shock was the Houthi takeover of the capital city Sana'a, which occurred in September of 2014. According to news outlets, anti-government protests began in the city at the end of August, and continued through mid-September. Clashes and a 4-day siege of the city by Houthi rebels began on September 16'th, after which the capital was under Houthi control.<sup>23</sup>

Following the capture of Sana'a, there was an increase in the average number of nutrient deficiencies for individuals in the city, and when combined with the little evidence of a change over the same time period in 2005, the capture of the city arguably caused a worsening of diet quality. However, there was very little

<sup>23</sup> See Al Jazeera (Accessed March 2017): <http://america.aljazeera.com/articles/2014/9/25/houthi-yemen-takeover.html>.

change in the average number of nutrient deficiencies in the rest of Yemen, and this lack of difference is similar to the lack of difference over the same period in 2005.

In addition to an increase in the number of average nutrient deficiencies in response to the capture of Sana’a, the depth of nutrient shortfalls also increased. Specifically, when analyzing the total consumption of each nutrient individually in Sana’a, there was a statistically significant increase in the shortfall of consumption (the percentage consumption is below EAR) for 11 out of 17 reported nutrients at standard significance levels, and one cannot reject the hypothesis of no change in the remaining 6 nutrients. Despite this significant worsening of nutrient availability, the evidence of a decrease in overall calorie consumption is less robust.<sup>24,25,26</sup>

Table 3.3: Change in Access to Food in Sana’a Following Rebel Control

	Restrict Sample to Sana'a (City)	Restrict Sample to Rest of Yemen
Change after Conflict Started- 2014	0.906**	-0.0004
Change over Same Period- 2005	-0.214	0.119
Difference-in- Difference	1.12**	-0.119

Source: World Bank staff calculations using HBS 2005/06 and HBS 2014

However, it is important to note that one cannot determine the exact reasons for the decline in diet quality following the surge in conflict and uncertainty. For example, the change in welfare might have been in response to violence and uncertainty preventing people from participating in the labor force, from being able to acquire necessary goods and services, or in response to a disruption of government services. Despite not being able to better identify the exact mechanism causing the decline, the decline in diet quality following the capture of the city helps illustrate how the escalation of conflict in March of 2015 likely further worsened food availability from an already poor baseline for the rest of the country.

In addition to the change in security in Sana’a, there were other important shocks during the collection of the 2014 HBS. In particular, the government reduced its fuel subsidy, which accounted for over twenty percent of the total budget. The subsidy directly helped households consuming fuel and indirectly helped all households as an intermediate input in a broad array of goods. Specifically, the government increased the price of fuel by 60 percent and the price of diesel by 95 percent at the end of July.<sup>27</sup> Based on reporting, the price of many goods in particular locations, including food goods, had significantly increased

<sup>24</sup> The pre-period includes all households surveyed between April and the beginning of the conflict. The choice of this pre-period is driven by the timing of the 2005 survey, which began in April 2005 and concluded in March of 2006. However, the results are robust to using a pre-period that is either longer or shorter.

<sup>25</sup> The pre-period excludes households surveyed in August due to the near elimination of a large fuel subsidy across the country. However, all results are robust to including households surveyed in August to the pre-period. Furthermore, the lack of a response in the rest of Yemen suggests that the decline in diet quality in Sana’a is not being driven by the reduction in the fuel subsidy.

<sup>26</sup> Ramadan occurred in the pre-period in July of 2014 and the post period in October of 2005. However, when excluding all households surveyed during July and October of both surveys, the results are qualitatively identical.

<sup>27</sup> See the Guardian (accessed March 2017): <https://www.theguardian.com/global-development/2014/aug/26/yemen-fuel-subsidy-cut-drives-poorest-poverty>.

immediately following the removal of the subsidy.<sup>28</sup> However, the government reversed the subsidy decrease on September 2<sup>nd</sup> in response to large protests in the capital.<sup>29,30</sup>

Although the reduction in the fuel subsidy was short-lived, and the fuel subsidy might have been restored before the increase in fuel prices could fully be absorbed by consumer prices, the 2014 HBS allow a preliminary investigation of how households responded. Investigating the response of household food consumption of households surveyed in August, one cannot reject the hypothesis that either the quality or quantity of calories changed- either during 2014, or relative to 2005.

Despite little evidence of a change in total consumption or diet quality, there is evidence that households changed other aspects of their food consumption. In particular, households actually decreased the riyals spent per calorie on average relative to earlier in the year, and this decrease was significantly larger than the little change in average prices paid per calorie in the 2005 HBS. Importantly, the average decrease in the price of calories disappeared after the fuel subsidy was reinstated.<sup>31</sup> However, this decrease in calories per riyal was not uniform across food groups. In particular, there were actually large decreases in riyals per calorie in legumes, fruit, and meat; there were significant increases in the price of calories from spices and beverages; and one cannot reject the hypothesis of no change in the price of calories from grains, vegetables, and dairy.<sup>32</sup>

Table 3.4: Change in Price of Calories and Diet Quality following the Removal of the Fuel Subsidy

	<u>Restrict Post-Period to Households Surveyed while Subsidy was Reduced</u>		<u>Restrict Post-Period to Households Surveyed After Subsidy Restored</u>	
	Riyals per Calorie	Number of Nutrient Deficiencies	Riyals per Calorie	Number of Nutrient Deficiencies
Increase After Decrease in Fuel Subsidy-2014	0.003	-0.016	0.004**	0.223***
Increase Over Same Period 2005	-0.014**	0.086	0.002	0.101
Difference-in- Difference	-0.018**	0.102	-0.003	-0.122

Source: World Bank staff calculations using HBS 2005/06 and HBS 2014

Given the complexity of the issue, more investigation is needed to fully characterize how households responded to the drastic removal of the fuel subsidy. However, this consumption pattern does not necessarily contradict the larger food prices that were largely reported across the country. Rather, the consumption patterns could be consistent with households choosing lower quality food items within a

<sup>28</sup> See BBC (accessed March 2017): <http://www.bbc.com/news/world-middle-east-14704951>.

<sup>29</sup> See Al Jazeera (accessed April 2017):

<http://www.aljazeera.com/news/middleeast/2014/08/2014829194418325716.html>

<sup>30</sup> However, as mentioned above, the protests in Sana'a continued despite the reversal of the fuel subsidy.

<sup>31</sup> Similar to the estimates of how the capture of Sana'a affected households, Ramadan occurred in the pre-period in July of 2014 and the post period in October of 2005. However, when excluding all households surveyed during July and October of both surveys, the results are qualitatively identical.

<sup>32</sup> All estimates exclude Sana'a city to try to avoid capturing factors unrelated to the removal of the fuel subsidy.

food category in response to the rising prices of many consumer goods (e.g., goat instead of beef, a lesser cut of beef, etc.), and this substitution outweighed the increase in food prices. However, for food categories where there are not large quality differences within the individual food items and this substitution was not as readily available, the cost of calories could have actually increased. It is possible that both spices and beverages, both of which had an increase in the price of calories and contained a number of processed foods (e.g., “carbonated beverages,” etc.), had more limited substitution of this kind.

The pattern described above, where the price paid per calorie increased for particular food groups and decreased for others, is common across the entire country. However, there are strong regional differences in the weight of consumption placed on different food groups. In particular, consumption in Al Mahrah and Hadramout was strongly weighted towards food groups where the average price paid per calorie declined, and thus, the average price paid per calorie from all food groups in those two governorates strongly declined. In fact, once excluding households from those two governorates, one cannot reject the hypothesis that there was no change in the price of calories in the rest of Yemen. Thus, regional differences in consumption patterns, regional differences in the pass-through of the subsidy, and regional differences in spillover effects of the subsidy removal to employment and wages could have further complicated this relationship.

Table 3.5: Change in Price of Calories and Diet Quality following the Removal of the Fuel Subsidy by Region

	<u>Restrict Sample to Al Mahrah and Hadramout</u>		<u>Restrict Sample to Rest of Yemen</u>	
	Riyals per Calorie	Number of Nutrient Deficiencies	Riyals per Calorie	Number of Nutrient Deficiencies
Increase After Decrease in Fuel Subsidy-2014	0.016*	1.38*	0.003	-0.096
Increase Over Same Period 2005	-0.208***	-2.18***	-0.003	0.217
Difference-in-Difference	-0.224***	-3.57***	-0.006	0.313

Source: World Bank staff calculations using HBS 2005/06 and HBS 2014

## Conclusion

As of 2014, a large share of the Yemeni population had inadequate access to food. Estimates suggest that approximately 10.8 million Yemenis were undernourished, which translated to slightly over forty percent of the total population; and much larger shares of the population suffered from nutrient deficiencies. The large prevalence of undernourishment has persisted since the early nineties, and suggests that even prior to the escalation of conflict and the threat of famine<sup>33</sup>, it was likely going to be difficult for Yemen to meet the Sustainable Development Goals of improving nutrition and eliminating hunger by 2030.

<sup>33</sup> See Al Jazeera (Accessed April 2017): <http://www.aljazeera.com/news/2017/03/famine-United-nations-170310234132946.html>.

Furthermore, access to nutrients and calories from non-grains sources worsened between 2005 and 2014, and the decline was similar for both poor and non-poor individuals. The decline in diet quality corroborates the significant increase in poverty and overall decline in welfare during the time period. Furthermore, there was also evidence of seasonal changes in consumption, which suggests that a potentially larger share of the population might have had inadequate access to food at some point in the year than indicated by the prevalence of undernourishment and nutrient deficiencies.

Although food security was already very poor in Yemen in 2014, conflict has dramatically worsened access to food. In particular, both the Houthi capture of Sana'a and the escalation of conflict that began in 2015 have significantly contributed to this decline. Estimates from the 2014 HBS suggest a significant worsening of diet quality in Sana'a following the Houthi capture of the city. Furthermore, estimates from the 2015 and 2016 Gallup World Poll suggest a further worsening of food access across the country following the escalation of conflict in 2015; and households whose livelihood or assets were affected by the conflict in 2016 were not only more likely to report a worsening of diet quality, but also were much more likely to report experiences consistent with extreme undernourishment. Given that approximately 53 percent of the population that had reported to having their assets or livelihood directly affected by the conflict by September 2016, and the fact that this figure has likely risen given salaries of many public sector employees have not been paid since then, the current food security situation is dire for a large share of Yemenis.

These estimates derived from the 2014 HBS and the September 2016 GWP show a similar decline in food security following the escalation of conflict as the 2016 Emergency Food Security and Nutrition Assessment conducted by FAO in November 2016, and are consistent with the risk of famine now faced by a large share of the population. However, the estimates in this chapter further demonstrate that the strongest risk factors associated with extreme coping strategies were households that lost their main source of income due to conflict, and households that were displaced due to conflict. Identifying and targeting these households with emergency aid might help mitigate the worst effects of severe undernourishment.

In addition to describing the state of Yemeni food security, the collection of the 2014 HBS during significant shocks could yield important insights that are important to the reconstruction of Yemen and could further be important to other contexts. First, the Houthi capture of Sana'a is a unique opportunity to better understand the effect conflict has on consumption, and to better identify the many potential mechanisms by which conflict might affect household welfare. And second, a more thorough analysis of how purchasing and consumption decisions responded to the dramatic reduction of the government fuel subsidy might better inform policymakers how fuel subsidies might affect consumer prices and employment in general, and the manners in which households might be better supported in other contexts as fuel subsidies are potentially decreased.

## References

- Block, Steven A., Lynnda Kiess, Patrick Webb, S. Kosen, Regina Moench-Pfanner, Martin W. Bloem, C. Peter Timmer. 2004. "Macro Shocks and Micro Outcomes: Child Nutrition During Indonesia's Crisis." *Economics and Human Biology* 2(1): 21-44.
- Brinkman, Henk-Jan, Saskia de Pee, Issa Sanogo, Ludovic Subran, and Martin Bloem. 2009. "High Food Prices and the Global Financial Crisis Have Reduced Access to Nutritious Food and Worsened Nutritional Status and Health." *Journal of Nutrition* 140(1): 153-161.
- Brown, C., M. Ravallion, and D. van de Walle. 2017. "Are Poor Individuals Found in Poor Households? Evidence using Nutrition Data for Africa." Working Paper, Georgetown University, Washington, D.C.
- Coates, J. 2013. "Build it Back Better: Deconstructing Food Security for Improved Measurement and Action." *Global Food Security* 2 (3), 188-194.
- Deaton, Angus and J. Dreze (2009): "Food and Nutrition in India: Facts and Interpretations", *Economic and Political Weekly*, 44(7): 42-65.
- D'Souza, Anna, and Dean Joliffe. 2012. "Rising Food Prices and Coping Strategies: Household-level Evidence from Afghanistan." *Journal of Development Studies*, 48 (2), 282-299.
- D'Souza, Anna, and Dean Joliffe. 2014. "Food Insecurity in Vulnerable Populations: Coping with Food Price Shocks in Afghanistan." *American Journal of Agricultural Economics* 96 (3): 790-812.
- FAO. 2001. "Human Energy Requirements." Technical Report, Joint FAO/WHO/UNU Expert Consultation, Food and Nutrition Technical Report Series, Rome.
- FAO. 2014. "State of Food Insecurity in the World: Strengthening the Enabling Environment for Food Security and Nutrition." Technical Report, Rome.
- FAO. 2016. "Emergency Food Security and Nutrition Assessment." Technical Report, Rome.
- Glewwe, P., and E. Miguel. 2008. "The Impact of Child Health and Nutrition on Education in Less Developed Countries," in P. Schultz and J. Strauss, eds., *Handbook of Development Economics*, Vol. 4: 5-56. Amsterdam: North-Holland.
- Institute of Medicine of the National Academies. 2006. "Dietary Reference Intakes: the Essential Guide to Nutrient Requirements," J. Otten, J. Pizzi Hellwig, and L. Meyers, eds. National Academies Press: Washington, D.C.
- Joliffe, D., and U. Serajuddin. 2015. "Estimating Poverty with Panel Data, Comparably. An Example from Jordan." Policy Research Working Paper, Washington, D.C.
- Rosen, S., B. Meade, K. Fuglie, and N. Rada. "International Food Security Assessment, 2014-2024." Technical Report, Economic Research Service, USDA, Washington, D.C.
- Subramanian, S., and A. Deaton. 1996. "The Demand for Food and Calories." *Journal of Political Economy* 104 (1), 133-162.
- Upton, J., J. Cisse, and C. Barrett. 2016. "Food Security as Resilience: Reconciling Definition and Measurement." Working Paper, Cornell University, January.

Von Grebmer, K., D. Headey, T. Olofinbiyi, D. Weismann, S. Yin, Y. Yohannes, C. Foley, C. Von Oppeln, B. Iseli, C. Bene, L. Haddad. 2013. "Global Hunger Index: the Challenge of Hunger." Technical Report, International Food Policy Research Institute, Washington, D.C.

Webb, P., J. Coates, E. Frongillo, B. Rogers, A. Swindale, and P. Blinsky. 2006. "Measuring Household Food Insecurity: Why It's So Important and Yet So Difficult to Do." *Journal of Nutrition* 136, 1404S-1408S.

World Food Programme. 2012. "The State of Food Security and Nutrition in Yemen, 2012." Comprehensive Food Security Survey, WFP, Rome, Italy.

## Chapter 4 : Social Protection during Times of Conflict<sup>34</sup>

### Introduction

The most recent information regarding household welfare in Yemen is the Household Budget Survey (HBS), conducted just prior to the current crisis in 2014. The HBS contains a detailed social protection module with a wealth of data that has not previously been accessible in conjunction with consumption data. Households are questioned about an exhaustive list of transfers and safety net schemes, as well as private transfers received and given. A separate module asks about the shocks and problems the household has faced during the past year and the ways in which the household responded. The combination of these modules allows for a much more detailed analysis of the coverage and incidence of programs and their targeting to poor areas and poor people than has previously been available. Although hardly a substitute for more up-to-date information, the 2014 data can be of use for understanding some of the ways in which the current crisis might be affecting households throughout Yemen.

This chapter reviews and assesses Yemen's social protection programs together with the evidence on household poverty, vulnerability and shocks using information available in the 2014 survey. Where possible, comparisons are made with the information from the previous Household Budget Survey conducted in 2005. Government and private transfer receipts are contrasted and how these vary with household expenditure between urban and rural households is examined. The chapter then speculates on how an interruption in these transfers may have affected households.

The chapter links the analysis to gender whenever relevant. In particular, it examines the living standards of female headed households (FHH) relative to those of male headed households (MHH), including those headed by widows and their access to social protection programs. The questionnaire added a number of new questions on women's marital history, including whether there have been previous marriages and how they ended (divorce by husband or by wife, or widowhood), and whether any offspring live with the mother. Research elsewhere has found widows to be particularly discriminated against and disadvantaged, and women in general to be significantly vulnerable to marital shocks. Nationally, 8% of households are headed by women. As there is thought to be a concentration of FHHs among public and private transfer recipients, we will focus on these households throughout the chapter. It is believed, for example, that many of the beneficiaries of the country's Social Welfare Fund are FHHs. We aim to better understand their welfare and situation and whether they are among the poorest households or become beneficiaries for cultural reasons.

Although the data precede the 2015 crisis and recent civil war, the 2014 survey is useful for establishing the situation immediately before the 2015 events. This can provide a baseline for future monitoring. Estimates using the 2014 data can also simulate how the poverty rate would be affected in the event of an interruption of government and private transfers as observed since 2015. Households are also asked about various household-level shocks that may have occurred in the past 12 months, such as weather-related shocks, employment shocks, and death or injury of family members. We also examine the incidence of these shocks and their impact on household income and assets.

---

<sup>34</sup> Primary Authors: Caitlin Brown, Dominique van de Walle & Afrah Al Ahmadi

## Poverty and Vulnerability in Yemen

Even prior to the recent conflict, Yemen faced considerable challenges to promoting economic and social development given its low per capita income and human development starting base, its limited resources and rapidly increasing population. The impact of the ongoing conflict is further complicating prospects for Yemen's pre-war social policies and programs to have a meaningful impact. The two years of conflict have witnessed a significant increase in poverty and food insecurity. New categories of vulnerability have also emerged due to the social and economic distress resulting from the conflict. Poverty levels are estimated to have increased from 35.4% in 2005 to 48.6% in 2014 to a simulated 77% today. Food insecurity, estimated to impact around 47% of the population in 2005, is estimated by WFP to affect 17.1 million Yemenis or 60% of the population today. Vulnerabilities have also significantly increased both in type and prevalence, resulting from wide spread disruption of livelihood, displacement and violence.

Vulnerabilities pre-crisis were largely associated with female-headed households, the unemployed poor, those with livelihoods in the informal sector, the disabled and the elderly without pensions. While these groups remain, a number of new categories are expected to join them, namely internally displaced people, persons with conflict-related disabilities and orphans of those deceased. These add to the challenges Yemen and its social policies need to address both immediately and in the post-conflict phase.

According to United Nations data, since the escalation of the conflict in March 2015 an estimated 10,000 people have lost their lives and multiples more have been wounded. More than 3 million people have been internally displaced since the conflict erupted. Yemen is facing an unprecedented food crisis and the UN is now predicting famine as a tangible risk. About 17 million Yemenis are considered food insecure. Nearly 3.3 million, including 462,000 children under five, are suffering from severe acute malnutrition, a 57% increase since late 2015. Furthermore, disruption of essential food imports increases the risk of famine. Several factors have limited the buying power of the Yemeni population in all segments of society as the cost of food, energy, and essential goods has surged. An estimated 8 million Yemenis have lost their livelihoods or are living in communities with minimal to no basic services. The agricultural sector, where most Yemenis were employed before the conflict, has shrunk dramatically, shedding an estimated 70 percent of its workers since the crisis. The private sector has contracted leading to further lay-offs. Public cash transfers to the poor ceased in early 2015, and most civil servants have not received their salaries since September 2016. The current situation has resulted in a large percentage of the population without any type of social protection and hence at high risk of food insecurity, extreme poverty and irreversible damage to their human capital.

## Overview of Social Protection in Yemen

Prior to the current conflict, the Government of Yemen (GoY) had instituted an array of social policies and programs that provide a diverse set of benefits to the population. These include: (a) energy subsidies; (b) contributory social security (pension) programs covering public and private sector employees in the formal sector; (c) social safety net programs, including unconditional cash transfers through the Social Welfare Fund (SWF); conditional cash transfers through the cash-for-work (CFW) program implemented through the Social Fund for Development (SFD); and in-kind benefits for people with disabilities through the Disability Fund; (d) active labor market policies through a labor intensive public works program implemented by the Public Works Project (PWP); small and micro-enterprise development programs through SFD, the small and micro-enterprise promotion program (SMEPS), and the Agriculture and Fishery Promotion Fund; and (e) targeted community-based basic service delivery through SFD.

These national programs were established in the mid-1990s with the aim of mitigating the negative impacts of the economic reforms undertaken by the Government of Yemen at that time. With the exception of the SFD interventions and PWP, these programs have been fully funded by the Government. SFD and PWP have depended mostly on donor funding through grants, credits and loans provided to the GoY. The following is a brief overview of the largest public social protection programs, based on a 2008 review by the World Bank.

### Government Subsidies

The largest component of public transfers consists of energy subsidies. Significant direct subsidies are provided on a variety of petroleum products, including diesel, petrol, kerosene and LPG. In 2008, it is estimated that these direct and indirect fuel subsidies absorbed 11% of GDP, exceeding expenditures on wage payments or social expenditures. These are a very inefficient form of safety net. Energy subsidies have three main problems. First, they are costly and divert significant resources from alternative investments, including social programs and infrastructure. Second, they distort the use of subsidized commodities, encouraging underproduction for domestic markets and overconsumption. And third, critical from a safety nets perspective, they are an extremely inefficient way of delivering benefits to the poor. It is estimated that more than 77% of the direct subsidies on petroleum products accrues to the non-poor, while only 23% goes to the poor. The GoY undertook modest but unpopular, and hence interrupted, steps to reform its subsidy program between 2009 and 2014. As of 2014, pre-conflict, the direct and indirect fuel subsidies were estimated to still absorb a large share of GDP. Unfortunately, however, the present analysis is unable to examine the incidence or impact of energy subsidies.

### Government and Donor Funded Cash Transfers

Yemen's public cash transfer programs fall under two primary categories: pensions and social assistance programs. Pension schemes come in the form of public, military, or private schemes. There are a few social assistance programs, with the largest in coverage being the Social Welfare Fund (SWF), and the most feasible for rapid scale-up being the cash-for-works program.

*Pensions:* Formal pension provision provides substantial old age income protection and insurance against work injury, disability and death. There are three main pension schemes. The civil service pension scheme (GASSP) covers just over 500,000 members (civil servants, state and municipal employees and employees of partially or fully-owned public enterprises) and provides benefits to an estimated 64,000 old-age retirees, disabled and survivor beneficiaries receiving annuitized benefits. Though information on the Military Pensions Scheme is limited, it is estimated to have 320,000 active members and 110,000 beneficiaries (old-age retirees, disabled soldiers, survivors of deceased soldiers and retirees, and recipients of special benefits for casualties of conflict). The private sector pension scheme (GCSS) has just under 90,000 members (including workers in officially registered enterprises and self-employed) and provides benefits to 2,200 retirees, disabled and survivor beneficiaries receiving annuitized benefits.

Despite the number of schemes, coverage is low, and only a small proportion of the labor force receives any type of pension. The active membership of GASSP, the Military and GCSS represent 12.2%, 7.6% and 2.1% of the labor force respectively.

Pension benefits are broadly similar between the schemes for the public sector employees (GASSP) and private sector workers (GCSS) but the military has more generous terms (for example, an accrual rate of 5 percent of final salary compared to less than 3 percent in civilian pensions while the maximum replacement rate of 100 percent of final salary is reached only after 20 years of service in the military).

Disability benefits are provided to all three groups on comparable grounds. Survivorship benefits are provided to survivors of civil servants and private sector workers who die while on active duty or while receiving an old-age pension. Beneficiaries include (a) wives (provided that they have not remarried); (b) sons (under 18; students age 18-25; or totally disabled); (c) daughters at any age (provided they are unmarried); and (d) parents (provided that they had been dependents of the deceased). Benefits are split equally across all eligible survivors.

*Unconditional cash transfers (Social Welfare Fund):* The program with the widest coverage, Yemen's Social Welfare Fund (SWF), is a targeted cash transfer program that aims to help poor households. To be eligible, a household must be deemed poor and not receive other forms of government assistance. It was initially targeted on a categorical basis to certain groups, including widowed, divorced or single women with or without children; the disabled and the elderly; and households without a head. An attempt at reassessing eligibility took place in 2008 through a recertification survey covering one million existing beneficiaries and some 0.7 million new applicants. As a result, 500,000 new beneficiary households were identified as eligible from the waiting list and added to the rolls in 2011. Subsequent analysis using a proxy means test (PMT) based on the 2005 HBS identified 18% of these as ineligible. These households remain beneficiaries nonetheless. There is considerable inertia in the programs with households typically not removed from the rolls after losing eligibility. Since 2008, a PMT based eligibility criteria has replaced the previous categorical conditions.

*Cash-For-Works:* The CFW program was initiated in 2009 in response to the 2008 food crisis. Initially, the program targeted the unemployed in food insecure regions with income support through temporary wage employment. The program coverage changes over time, subject as it is to funding and emerging crises. However, it is quite limited in coverage and not well represented in the survey data. For example, administrative data indicate that coverage at its peak in 2013 was around 63,000 households with average wage benefit of \$500 per participating household. In 2014, it was a lower 55,617 households. Despite low coverage, the program has demonstrated encouraging outcomes. An impact evaluation of the CFW found *“statistically significant program effects on food consumption, debt repayment and durable goods ownership,”* and that *“the program played a role in cushioning targeted communities from the economic shock of 2010–2011”*.<sup>35</sup> It is therefore a good prospect for scaling up.

*Other Social Assistance and Active Labor Market Policies:* Several other social assistance programs that provide non-cash benefits to recipients include the Disability Fund (which provides both cash and in-kind benefits), school feeding programs, and emergency food distribution. As noted above, there are also a number of employment related schemes that aim to aid households with livelihoods and matching them with income earning opportunities.

## Descriptive Statistics

We begin in Tables 4.1 and 4.2 with some descriptive statistics on several key variables nationally and by sector, as well as by gender of household head, for 2014 and 2005 respectively. A few factors stand out: the country appears to be urbanizing at a slow pace, from 27% of the population in 2005 to 30% 10 years later. In both rounds, urban households have much higher average consumption values than rural households with the rural mean just over half that in urban areas. Strikingly, real average household per capita consumption declined over time in both sectors as well as for both female and male headed

---

<sup>35</sup> The evaluation was funded by the U.K. Department for International Development and conducted during 2011–2013 by the University of California Berkeley and the RAND Corporation.

households.<sup>36</sup> Household size has declined slightly from 9.5 in 2005 to 9.1 in 2014, and more so in urban areas (9.1 to 8.4) relative to rural areas (9.6 to 9.4). It can also be remarked that a larger total share of households are agricultural producers in 2014. This increase is entirely attributable to rural areas. Fewer urban households report engaging in agricultural production over time.

At both dates, female headed households tend to be concentrated in urban areas. Over time there appears to be a rise in the overall share of households headed by women from 5% to 8%. In 2014, there is only a small difference in average per capita consumption between male and female headed households. Yet, strikingly, FHHs were clearly richer on average at the earlier date. This may be attributable to a reduction in private transfers received. However, given the lack of information on private remittances in the 2005 survey, no corroboration is possible. Certainly, in 2014, a much higher proportion of FHHs receive transfers than MHHs, with more than 40% of the former receiving a transfer from abroad and almost 20% receiving internal transfers. In contrast, only 16 and 11% of MHHs receive transfers from outside and within Yemen respectively.

---

<sup>36</sup> Unless otherwise noted, all monetary amounts are expressed in 2014 annual, spatially adjusted per capita riyals (YR).

Table 4.1: Descriptive Statistics by Sector and Gender of Head, 2014

	Sector		Gender of Head		
	Rural	Urban	Male	Female	National
Consumption per capita	171,589 (116,510)	322,353 (291,536)	217,124 (200,067)	216,470 (196,343)	217,072 (199,765)
<i>Living conditions</i>					
Urban			0.296	0.366	0.302
Owns house	0.898	0.662	0.828	0.812	0.827
House is a hut	0.054	0.013	0.040	0.061	0.041
Wall: rudimentary	0.178	0.076	0.151	0.102	0.147
Roof: rudimentary	0.080	0.026	0.062	0.078	0.064
Floor: rudimentary	0.013	0.136	0.047	0.083	0.050
Water supply sufficient	0.767	0.628	0.726	0.720	0.725
Electricity available daily	0.761	0.891	0.809	0.842	0.811
Has agricultural land	0.647	0.079	0.489	0.318	0.476
Agricultural producer	0.761	0.148	0.642	0.515	0.633
Receiving remittances from within Yemen	0.119	0.097	0.105	0.199	0.112
Receiving remittances from abroad	0.188	0.148	0.155	0.423	0.176
<i>Head of household</i>					
Female	0.072	0.097			0.080
Age	45.9	47.1	46.2	46.8	46.2
Married	0.937	0.913	0.968	0.491	0.930
Divorced	0.005	0.010	0.003	0.050	0.007
Widowed	0.039	0.057	0.010	0.446	0.045
Never married	0.019	0.019	0.019	0.014	0.019
Spouse in household	0.898	0.874	0.964	0.056	0.891
Primary education	0.616	0.675	0.638	0.627	0.638
Secondary education	0.430	0.558	0.481	0.300	0.476
<i>Household demography</i>					
Household size	9.41	8.43	9.31	6.78	9.11
Dependency ratio	1.28	0.93	1.14	1.58	1.18
Share: 0 to 5 female	0.082	0.069	0.078	0.071	0.078
Share: 0 to 5 male	0.089	0.072	0.084	0.079	0.083
Share: 6 to 14 female	0.132	0.112	0.126	0.127	0.126
Share: 6 to 14 male	0.143	0.121	0.135	0.150	0.136
Share: 15 to 64 female	0.269	0.308	0.275	0.353	0.281
Share: 15 to 64 male	0.242	0.283	0.261	0.173	0.254
Share: 65 and older female	0.022	0.017	0.019	0.043	0.021
Share: 65 and older male	0.021	0.018	0.021	0.004	0.020

Note: World Bank staff calculations using HBS 2014. All statistics are population weighted. Consumption is per capita and deflated spatially. Currency is in 2014 riyals. There are 9,391 households in total. Consumption is available for 9,376 households only. Standard deviations in parentheses.

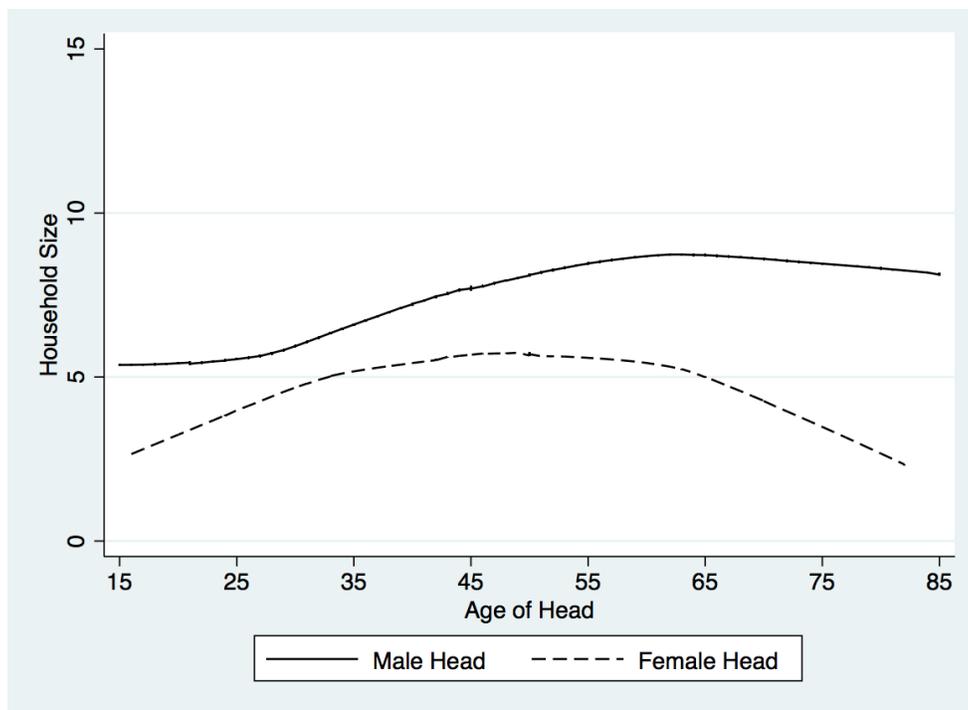
Table 4.2: Descriptive Statistics by Sector and Gender of Head, 2005/06

	Sector		Gender of Head		National
	Rural	Urban	Male	Female	
Consumption per capita	209,261 (181,366)	360,416 (344,321)	249,259 (231,830)	277,284 (444,003)	250,651 (246,757)
<i>Living conditions</i>					
Urban			0.271	0.321	0.274
Owns house	0.906	0.677	0.845	0.810	0.843
House is a hut	0.067	0.031	0.059	0.032	0.058
Wall: rudimentary	0.187	0.126	0.175	0.072	0.170
Roof: rudimentary	0.081	0.032	0.069	0.037	0.068
Floor: rudimentary	0.021	0.035	0.025	0.016	0.025
Water supply sufficient	0.676	0.736	0.688	0.755	0.691
Electricity available daily	0.948	0.980	0.964	0.980	0.964
Has agricultural land	0.727	0.157	0.577	0.460	0.571
Agricultural producer	0.611	0.434	0.600	0.497	0.596
Receiving remittances from within Yemen					
Receiving remittances from abroad					
<i>Head of household</i>					
Female	0.046	0.058			0.050
Age	46.2	46.6	46.4	44.7	46.3
Married	0.939	0.911	0.952	0.538	0.932
Divorced	0.004	0.011	0.004	0.043	0.006
Widowed	0.028	0.048	0.015	0.399	0.034
Never married	0.029	0.030	0.030	0.019	0.029
Spouse in household	0.908	0.891	0.948	0.058	0.903
Primary education	0.719	0.817	0.760	0.551	0.757
Secondary education	0.301	0.475	0.371	0.200	0.368
<i>Household demography</i>					
Household size	9.61	9.19	9.64	6.86	9.50
Dependency ratio	1.33	1.00	1.22	1.57	1.24
Share: 0 to 5 female	0.087	0.076	0.085	0.071	0.084
Share: 0 to 5 male	0.092	0.081	0.089	0.077	0.089
Share: 6 to 14 female	0.136	0.113	0.129	0.140	0.130
Share: 6 to 14 male	0.148	0.126	0.142	0.151	0.142
Share: 15 to 64 female	0.257	0.290	0.260	0.382	0.266
Share: 15 to 64 male	0.243	0.285	0.261	0.133	0.255
Share: 65 and older female	0.017	0.015	0.015	0.042	0.016
Share: 65 and older male	0.019	0.015	0.019	0.004	0.018

Note: World Bank staff calculations using HBS 2005/06. All statistics are population weighted. Consumption is per capita and deflated spatially. Currency is in 2014 riyals. There are 13,136 observations in total. Standard deviation in parentheses.

As is typical elsewhere in the world, FHHs are significantly smaller than MHHs with an average size of 6.8 (compared to 9.3) that has hardly budged over time. This is a relatively large difference.<sup>37</sup> Figures 4.1 and 4.2 show how household size moves with the age of the head by gender for 2014 and 2005, respectively. The patterns are similar across the years. The size difference is lowest between the ages of 25 and 35. The mean difference is close to one member around the ages of 30 to 35, after which it continues to rise. This minimum member difference presumably reflects young households with a missing (probably migrant) husband. FHHs also exhibit higher dependency ratios, are less likely to own the house they live in, and less likely to have agricultural land. The latter is likely to be associated with the fact that many FHHs have family members who live elsewhere and send transfers. Another key distinguishing attribute of FHHs relative to MHHs is the marital status of the head. Male heads are almost exclusively married (97%). Close to half of female heads are married (49%) with the remainder largely widowed (44%). Only 5% of female heads are divorced.

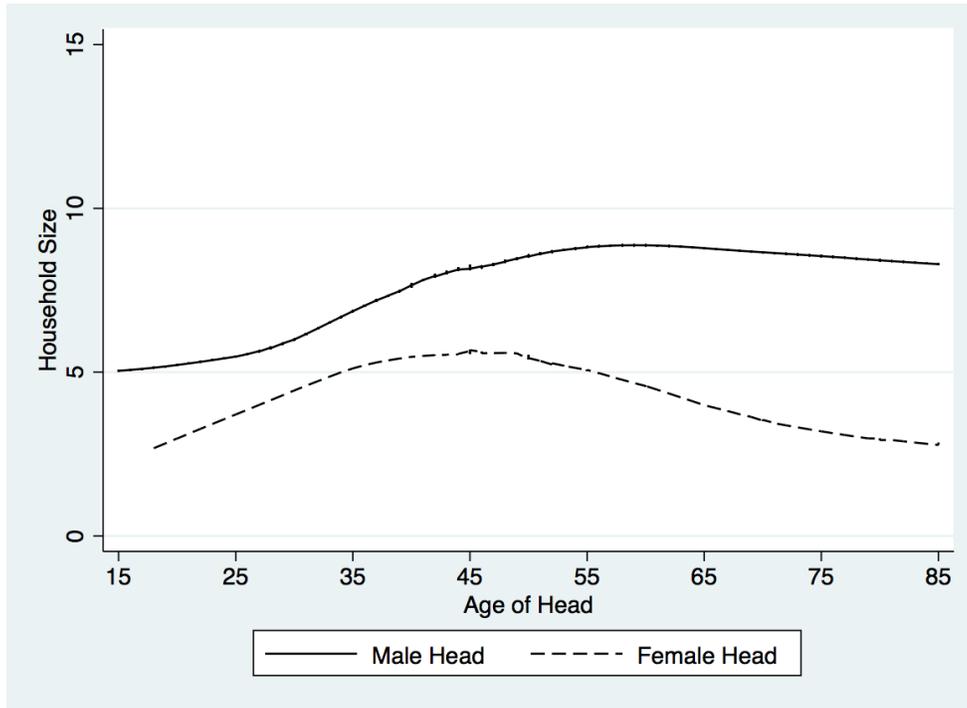
Figure 4.1: Household Size and Age of Head by Gender of Head, 2014



Note: World Bank staff calculations using HBS 2014. Lines are fitted using Lowess.

<sup>37</sup> As one point of comparison, recent data for 30 Sub-Saharan African countries, where households tend to be complex and large, indicates an average difference of 1.2 members (5.1 versus 3.9) (Milazzo and van de Walle 2017).

Figure 4.2: Household Size and Age of Head by Gender of Head, 2005/06



Note: World Bank staff calculations using HBS 2014. Lines are fitted using Lowess.

Table 4.3 delves a bit deeper into women’s marital status by providing means for various marital status categories for women between 15 and 49 years of age by sector. On average 59% of these women are currently married, with 97% of them once only. Women are more likely to be currently married in rural, as opposed to urban, areas (61% compared to 56%). Among those who have remarried, 71% were divorced by their husband, 9% instigated the divorce and 16% were widowed. Nationally, 37% of women between 15 and 49 years are never married, and only 4% are currently unmarried but have been previously married (among these women, divorce by the husband and widowhood are the most common reasons). The age at first marriage reported by households is relatively similar between the urban and rural sectors, at around 18 years of age. This may well reflect the legally determined statutory age rather than actual age at first marriage.

Table 4.3: Descriptive Statistics for Marital Status for Women aged 15 to 49

	Rural	Urban	Total
<i>Currently married</i>			
Total married	0.611	0.556	0.594
Married once	0.973	0.964	0.970
Remarried	0.027	0.036	0.030
Previously divorced by husband	0.740	0.662	0.712
Previously divorced by wife	0.109	0.067	0.094
Previously widowed	0.135	0.216	0.164
<i>Currently not married</i>			
Previously married	0.028	0.048	0.035
Divorced by husband	0.424	0.579	0.491
Divorced by wife	0.010	0.087	0.039
Widowed	0.457	0.424	0.445
Never married	0.360	0.396	0.371
<i>Mean age at first marriage</i>			
Total ever married	18.33	18.70	18.44
Currently married	18.36	18.74	18.47
Ever divorced	17.84	18.72	18.22
Ever widowed	18.06	17.53	17.87

Note: World Bank staff calculations using HBS 2014. Women between 15 to 49 years of age only are included. All statistics are population weighted. Total married plus previously married plus never married sum to one. Subcategories of remarried and previously married also sum to one. For example, the share of remarried women who have been previously divorced by their husband is 0.74.

Remittances have typically been an important source of income for many Yemeni households, particularly those in rural areas (van de Walle, 2002). Table 4.4 examines migration and remittances over the previous 12 months by sector and gender of the head for 2014.<sup>38</sup> Nationally, 8% of Yemeni households in 2014 had at least one household member who migrated abroad, with these households reporting on average 1.3 members who migrated abroad. During the same period 4% had the same average number of returnees. Both rural (10%), and female headed households (19%) are more likely to have a family member who has migrated outside Yemen. Across all types of households, the number of persons within a household who migrated abroad is larger on average than the number of persons who returned, suggesting a net outflow of migrants. Rural and female headed households are more likely to receive remittances both from within and outside Yemen and are less likely to send them relative to urban and male headed households respectively. For female headed households, remittances make up a considerable share of their total consumption – remittances received from outside Yemen represent 46% of total household expenditures, with the vast majority of remittances (93%) coming from a spouse or children. Another 24% of total expenditures for FHHs is derived from transfers within Yemen, with 66% of these transfers coming from a spouse or children. For rural households, remittances from abroad and internally account for 34% and 13% of total expenditures, respectively. Remittances from relatives abroad are by far the largest source of private transfers.

<sup>38</sup> Unfortunately, as noted above there is no point of comparison in the 2005 data.

Table 4.4: Descriptive Statistics for Migration and Remittances by Sector and Gender of Head, 2014

	Sector		Gender of Head		
	Rural	Urban	Male	Female	National
<i>Migration</i>					
Someone migrated outside Yemen	0.095	0.060	0.075	0.193	0.084
Number of persons migrated	1.231	1.536	1.316	1.206	1.296
Someone returned from outside Yemen	0.047	0.017	0.039	0.019	0.038
Number of persons returned	1.205	1.434	1.246	1.022	1.237
<i>Remittances within Yemen</i>					
Receive remittances	0.119	0.097	0.105	0.199	0.112
Value of remittances received	17,469	20,410	16,543	39,324	18,356
Share of remittances received of total expenditure	0.127	0.156	0.117	0.243	0.134
Share of remittances received from spouse/children	0.637	0.286	0.527	0.662	0.546
Share of remittances received from others	0.363	0.714	0.473	0.338	0.454
Send remittances	0.038	0.078	0.052	0.026	0.050
Value of remittances sent	5,058	10,876	7,105	3,439	6,813
Share of remittances sent of total expenditure	0.056	0.049	0.052	0.080	0.053
Share of remittances sent to spouse/children	0.487	0.250	0.373	0.428	0.376
Share of remittances sent to others	0.513	0.750	0.627	0.572	0.624
<i>Remittances outside Yemen</i>					
Receive remittances	0.188	0.148	0.155	0.423	0.176
Value of remittances received	89,457	75,515	73,609	219,921	85,251
Share of remittances received of total expenditure	0.337	0.249	0.280	0.458	0.315
Share of remittances received from spouse/children	0.808	0.617	0.718	0.932	0.759
Share of remittances received from others	0.192	0.383	0.282	0.068	0.241
Send remittances	0.006	0.010	0.007	0.010	0.007
Value of remittances sent	2,174	3,225	2,267	5,064	2,491
Share of remittances sent of total expenditure	0.146	0.070	0.088	0.321	0.115
Share of remittances sent to spouse/children	0.812	0.607	0.719	0.782	0.727
Share of remittances sent to others	0.188	0.393	0.281	0.218	0.273

Note: World Bank staff calculations using HBS 2014. All statistics are population weighted. Receive remittances indicates that the household received a remittance. Send remittances indicates that the household sent a remittance. Remittance values are spatially deflated and in 2014 per capita riyals. Share received/sent from spouse/children and from others sum to 1. Migration and remittances are for the last 12 months.

## Incidence of transfers

Ideally, government transfers from programs such as the Social Welfare Fund would be targeted to and reach the poor. However, an important issue in determining whether transfers are targeted towards the poor is first deciding what household welfare would have been without transfers. Distributional impact can only be assessed by estimating the incidence of transfers according to how poor households would have been without them. A common practice is to subtract the entire amount of government transfer receipts from household consumption to approximate pre-intervention welfare, and use that to rank the population into quantiles. In this case, one is assessing the transfer distribution relative to a counterfactual of no public transfers. However, this assumes that there is no replacement through household behavioral

responses. While that assumption is implausible, the opposite assumption — treating post-transfer consumption as the welfare indicator for assessing incidence — is just as questionable. Ideally, one would like to subtract the intervention amount but add in the replacement income households would have achieved through their behavioral responses had they not benefited from the intervention.<sup>39</sup> In the following analysis we will present transfer incidence using the two extremes — using pre-transfer and post transfer consumption to rank households by consumption per capita, referred to as net and gross expenditure respectively — such that the true level of household welfare in absence of transfers falls somewhere in between.

Table 4.5 begins by considering how the incidence and importance of remittances vary across gross and net expenditure population deciles.<sup>40</sup> The share of population living in households receiving at least some private transfer amounts varies between 20 and 36% across deciles, with an average of 27 percent receiving remittances either from within or outside Yemen overall. The table presents incidence under two assumptions about the counterfactual pre-transfer situation, namely fully excluding transfers from the ranking variable (net expenditure deciles) or fully including transfer incomes (gross) when assigning households to pre-intervention deciles. Concentrating on deciles defined on per capita expenditures net of transfers in the last 3 columns of Table 4.5, the results suggest a somewhat more pro-poor incidence of transfers with the poorest decile exhibiting the highest population share benefitting from remittances. But, it is also true that shares do not vary much across deciles. Among recipients, these private transfers make up a significant proportion of household consumption — equaling almost 70% for the lowest decile and tapering off monotonically. A somewhat less progressive but still pro-poor pattern among recipients is evident when ranking by gross expenditure deciles. Although among recipients 27% of expenditures are attributable to remittances on average, this is reduced to only 3% when considering Yemen's total population.

---

<sup>39</sup> A number of studies have used panel data to examine this and have estimated marginal propensities to consume out of transfer income around 0.5 (see discussion in van de Walle 2002). Jalan and Ravallion (2002) also estimate about 50% income replacement for public transfers in Argentina.

<sup>40</sup> Population deciles are calculated by ranking the population into national deciles by household per capita expenditures. Deciles are thus comparable across rural, urban or national populations.

Table 4.5: Remittances Received as a Share of Household Expenditure, 2014

Decile	Gross deciles			Net deciles		
	Pop share receiving remittances	Remittances as share of expenditures		Pop share receiving remittances	Remittances as share of expenditures	
		All	Recipients		All	Recipients
1	0.208	0.043	0.486	0.363	0.180	0.670
2	0.262	0.065	0.500	0.255	0.026	0.210
3	0.254	0.034	0.288	0.227	0.020	0.201
4	0.282	0.031	0.302	0.295	0.018	0.170
5	0.295	0.028	0.240	0.270	0.019	0.177
6	0.310	0.026	0.221	0.281	0.010	0.123
7	0.306	0.026	0.205	0.276	0.008	0.089
8	0.304	0.021	0.164	0.283	0.009	0.099
9	0.262	0.013	0.144	0.250	0.006	0.080
10	0.251	0.014	0.146	0.232	0.005	0.068
Total	0.273	0.030	0.269	0.273	0.030	0.269

Note: World Bank staff calculations using HBS 2014. All statistics are population weighted. Remittances include those from both within Yemen and outside Yemen. All is all households; Recipients are only the households who receive remittances. Expenditure is per capita and deflated spatially. Net expenditure is calculated as total household expenditure minus remittance amounts. Population deciles are created using gross and net expenditures respectively.

Turning to public transfers as well as informal private ‘charity’ transfers, Tables 6 and 7 provide some basic descriptive statistics on the participation in existing programs for the two survey years 2014 and 2005, respectively.<sup>41</sup> Statistics are listed for the rural, urban and national populations as well as by gender of the head. For each group, the mean incidence of participation and the average share of total expenditures among recipients represented by the cash or in-kind benefits are shown. We examine pension and retirement accounts for public servants, social assistance programs and active labor market schemes. Of these programs, by far the most important in terms of participation is the Social Welfare Fund (SWF).

At both dates, around 8% of Yemen’s population lives in a household that received a government pension. In 2005, this reflected 15% and 6% of the urban and rural populations respectively and in 2014, 14% and 6%. Still, as a share of household expenditures, the amounts received are more significant in rural areas amounting to 30% of total expenditures in 2014 as compared to 25% in urban Yemen (in 2005 the shares were similar at 27% and 20% for rural and urban areas respectively).

Though there are many social assistance schemes in Yemen, with the exception of the SWF, their coverage and cash benefits are low. In 2014, 29% of the population lived in households that benefit from the SWF yet at 4% of total household expenditures, these transfers account for a small share of consumption. Overall, coverage more than doubled between 2005 and 2014, from 12% to 29% of the national population. In 2005, the SWF covered just 14% and 9% of the rural and urban population respectively – in 2014 this had increased to 33% and 20%. However, no change in household expenditure share is apparent, with payments representing around 4% of total expenditures among recipients in both 2005 and 2014 (there is also little change for urban and rural areas separately).

<sup>41</sup> Although private charity transfers are not government related, we include them here as they often have the same objectives as social assistance transfers.

The next most widespread transfers in 2014 are from Zakat and charity. 10% and 8% of the population live in households who are recipients respectively, but here too the amounts transferred are tiny, accounting for 1% and 2% of recipient household consumption (Zakat is not asked about specifically in the 2005 survey). It is notable that those living in FHHs are more likely to receive assistance from Zakat (19% of the population living in FHHs) and charity (13%) relative to those living in MHHs as well as relative to rural and urban populations as a whole.

It is noteworthy that among the many programs with negligible population coverage, the cash for work and public works programs account for a significant share of their beneficiaries' living standards at around 10%. This is considerably higher than the share represented by the SWF transfers, for example This is true too for the few living in households who benefit from the Fund for Martyrs and Wounded. Overall, however, once one excludes the SWF, social assistance programs and training and employment schemes respectively cover 2.4% and 0.2% of the total population in 2014.<sup>42</sup>

---

<sup>42</sup> As the 2005 survey did not ask about all programs, a comparison with 2005 would be misleading.

Table 4.6: Descriptive Statistics for Public Transfers by Sector, 2014

	Sector				Gender of Head				National	
	Rural		Urban		Male		Female			
	Share of pop who receive program	Share of total expenditure	Share of pop who receive program	Share of total expenditure	Share of pop who receive program	Share of total expenditure	Share of pop who receive program	Share of total expenditure	Share of pop who receive program	Share of total expenditure
<i>Pensions</i>										
Public authority for social insurance	0.018	0.279	0.065	0.274	0.029	0.279	0.069	0.263	0.032	0.276
Public institution for insurance	0.002	0.375	0.009	0.190	0.004	0.253	0.007	0.227	0.004	0.249
Military and police pensions	0.030	0.323	0.059	0.232	0.039	0.272	0.040	0.379	0.039	0.281
Other pension program	0.008	0.237	0.008	0.150	0.009	0.209	0.005	0.257	0.008	0.211
Total	0.058	0.298	0.139	0.245	0.079	0.268	0.119	0.301	0.083	0.271
<i>Social assistance</i>										
Social Welfare Fund	0.329	0.045	0.201	0.032	0.286	0.041	0.350	0.053	0.291	0.042
Fund for Martyrs & Wounded	0.001	0.078	0.002	0.139	0.001	0.107	0.001	0.172	0.001	0.110
Cash for work	0.003	0.116	0.000	0.059	0.003	0.111	0.000	0.222	0.002	0.112
Disability fund	0.002	0.046	0.006	0.053	0.003	0.050	0.002	0.018	0.003	0.050
School feeding program	0.006	n/a	0.001	n/a	0.005	n/a	0.001	n/a	0.005	n/a
Emergency food distribution	0.028	0.015	0.014	0.019	0.024	0.015	0.020	0.022	0.024	0.015
Other in-kind program	0.030	0.013	0.007	0.014	0.022	0.013	0.030	0.013	0.023	0.013
Total	0.357	0.041	0.219	0.032	0.311	0.038	0.372	0.048	0.315	0.039
<i>Active labor market</i>										
Public works program	0.001	0.093	0.000	n/a	0.000	0.093	0.000	n/a	0.000	0.093
Agriculture & fishery promotion fund	0.001	0.048	0.000	n/a	0.001	0.048	0.000	n/a	0.001	0.048
Productive family program	0.000	n/a								
Skills training government	0.000	n/a	0.001	n/a	0.000	n/a	0.000	n/a	0.000	n/a
Skills training NGO	0.000	n/a	0.001	n/a	0.000	n/a	0.000	n/a	0.000	n/a
Total	0.002	0.066	0.002	n/a	0.002	0.066	0.000	n/a	0.002	0.066
<i>Private informal transfers</i>										
Zakat assistance	0.083	0.015	0.137	0.010	0.092	0.012	0.188	0.017	0.099	0.013
Charity	0.081	0.024	0.077	0.022	0.076	0.023	0.128	0.031	0.080	0.024
Total	0.151	0.018	0.192	0.014	0.153	0.016	0.279	0.022	0.163	0.017

Note: World Bank staff calculations using data from 2014 HBS. All statistics are population weighted. Receive program indicates the proportion of the population who are receiving the program. Share of total expenditure is the transfer amount divided by total expenditure among recipients only. Transfer incidence is for the last 12 months.

Table 4.7: Descriptive Statistics for Public Transfers by Sector, 2005/06

	Sector				Gender of Head				National	
	Rural		Urban		Male		Female			
	Share of pop who receive program	Share of total expenditure	Share of pop who receive program	Share of total expenditure	Share of pop who receive program	Share of total expenditure	Share of pop who receive program	Share of total expenditure	Share of pop who receive program	Share of total expenditure
<i>Pensions</i>										
Pension	0.056	0.271	0.149	0.204	0.081	0.235	0.107	0.247	0.083	0.236
Social Security Fund	0.080	0.049	0.047	0.048	0.072	0.048	0.055	0.058	0.071	0.048
<i>Social assistance</i>										
Social Welfare Fund	0.137	0.047	0.090	0.037	0.121	0.042	0.166	0.074	0.124	0.045
Fund for Martyrs & Wounded	0.007	0.072	0.004	0.078	0.006	0.065	0.004	0.268	0.006	0.073
International & local assistance	0.001	0.046	0.001	0.053	0.001	0.047	0.003	0.048	0.001	0.048
Disability fund	0.002	0.031	0.005	0.029	0.003	0.030	0.001	0.011	0.003	0.030
Agriculture & fishery promotion fund	0.000	0.047	0.000	0.190	0.000	0.115	n/a	n/a	0.000	0.115
<i>Private charity transfers</i>	0.165	0.015	0.174	0.014	0.159	0.014	0.284	0.025	0.168	0.015

Note: World Bank staff calculations using data from the 2005 HBS. All statistics are population weighted. Receive program indicates the proportion of the population who are receiving the program. Share of total expenditure is the transfer amount divided by total expenditure among recipients only. Transfer incidence is for the last 12 months.

Tables 4.8 and 4.9 show the incidence of both social assistance and all public transfers by net expenditure deciles for 2014 and 2005 respectively. There is a tendency for the bottom deciles to contain the largest share of population benefitting from social assistance and total transfers (particularly true for urban and FHHs in 2014, where the bottom decile has the largest share of recipients), and conversely for the wealthiest decile to have the smallest share. Similar patterns emerge in 2005. Nonetheless, in 2014, no less than 21% of the national population of the top net expenditure decile are in households that receive a least one type of transfer. The overall average share of beneficiaries is larger among rural households (40%) and largest for female headed households where it reaches 45%. Coverage for all programs has increased between 2005 and 2014, with only 27% of the population living in households who were transfer beneficiaries in 2005 versus 37.4% in 2014.<sup>43</sup> This is likely driven by the increase in coverage of social assistance programs (and the Social Welfare Fund in particular), which grew from reaching 13% of the population in 2005 to 32% of the population in 2014.

Table 4.8: Transfer Incidence by Net Expenditure Deciles 2014 (proportion of population living in households receiving each transfer)

Decile	Sector		Gender of Head		National
	Rural	Urban	Male	Female	
<b>Social Assistance Only</b>					
1 (poorest)	0.400	0.500	0.395	0.567	0.409
2	0.421	0.377	0.427	0.287	0.415
3	0.416	0.373	0.395	0.521	0.409
4	0.390	0.358	0.376	0.458	0.385
5	0.340	0.256	0.317	0.402	0.322
6	0.327	0.272	0.314	0.320	0.315
7	0.349	0.216	0.305	0.301	0.305
8	0.276	0.220	0.249	0.316	0.253
9	0.315	0.141	0.208	0.285	0.215
10	0.142	0.124	0.123	0.192	0.129
Total	0.357	0.219	0.311	0.373	0.316
<b>All transfers</b>					
1 (poorest)	0.461	0.700	0.472	0.639	0.487
2	0.491	0.552	0.516	0.306	0.499
3	0.438	0.424	0.412	0.630	0.436
4	0.458	0.450	0.459	0.438	0.456
5	0.334	0.355	0.331	0.485	0.339
6	0.333	0.346	0.328	0.451	0.336
7	0.417	0.340	0.396	0.345	0.392
8	0.309	0.329	0.307	0.458	0.317
9	0.308	0.240	0.261	0.380	0.271
10	0.202	0.208	0.198	0.311	0.207
Total	0.395	0.325	0.367	0.454	0.374

<sup>43</sup> However, given that the 2014 questionnaire asked about transfer schemes in a much more exhaustive and systematic way, differences may simply reflect a better representation of reality by the later survey.

Note: World Bank staff calculations using the data from the 2014 HBS. All statistics are population weighted. Expenditure deciles are calculated net of total transfer amounts. Transfer incidence refers to the share of the population living in households receiving one or more programs. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, Cash for work, Disability fund, school feeding program, emergency food distribution, and other in-kind programs. All public transfers include pensions, social assistance programs, and employment schemes. Pensions include the public authority for social insurance, public institution for insurance, military and police pensions, and other pension programs. Employment schemes in 2014 include temporary employment through public works project (PWP), Productive Family Program, skills training with the Ministry of Vocational Training, and skills training through NGOs. Charity and Zakat are not included.

Table 4.9: Transfer Incidence by Net Expenditure Deciles 2005/06 (proportion of population living in households receiving each transfer)

Decile	Sector		Gender of Head		National
	Rural	Urban	Male	Female	
<b>Social Assistance Only</b>					
1 (poorest)	0.200	0.222	0.192	0.331	0.203
2	0.174	0.171	0.168	0.278	0.174
3	0.177	0.214	0.183	0.188	0.183
4	0.158	0.187	0.162	0.190	0.164
5	0.193	0.134	0.173	0.277	0.180
6	0.097	0.124	0.103	0.112	0.104
7	0.106	0.095	0.101	0.144	0.103
8	0.082	0.068	0.079	0.061	0.078
9	0.115	0.051	0.086	0.085	0.086
10	0.062	0.035	0.043	0.052	0.044
Total	0.145	0.097	0.128	0.168	0.131
<b>All transfers</b>					
1 (poorest)	0.402	0.515	0.413	0.433	0.415
2	0.334	0.466	0.344	0.481	0.352
3	0.270	0.394	0.299	0.227	0.293
4	0.294	0.369	0.312	0.276	0.310
5	0.314	0.334	0.316	0.346	0.318
6	0.178	0.257	0.191	0.273	0.198
7	0.214	0.247	0.221	0.270	0.223
8	0.183	0.226	0.193	0.251	0.197
9	0.220	0.223	0.220	0.251	0.221
10	0.176	0.165	0.162	0.248	0.169
Total	0.271	0.269	0.268	0.305	0.270

Note: World Bank staff calculations using the data from the 2005 HBS. All statistics are population weighted. Expenditure deciles are calculated net of total transfer amounts. Transfer incidence refers to the share of population living in households receiving one or more programs. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, international & local assistance, Disability fund, and Agriculture and fishery promotion fund. All public transfers include pensions, Social Security Fund, and social assistance programs. Charity is not included.

Tables 4.10 and 4.11 list public transfer amounts as a share of gross and net expenditures for the national population and among those living in recipient households only for the 2014 and 2005 survey rounds, respectively. Among recipient households at both dates, pension income represents the highest share of expenditures for the bottom net expenditure population deciles. As a share of expenditures among recipient households, pension incomes are many orders of magnitude larger than incomes from all social

assistance transfers across the distribution of deciles. This pattern is altered when considering total population deciles. Looking at the expenditure shares of pension income across deciles containing all of Yemen's population, they are miniscule (3% on average). This highlights the fact that although pension transfers are relatively large, they reach only a small proportion of the population.

Given an average transfer incidence in 2014 of over 37% nationally, it is striking to see how negligible actual non-pension transfer amounts are as a share of total expenditure. All social assistance transfers (including the Social Welfare Fund) account for an average of 1.3% of household living standards nationally, and not much more at 4.6% when considering only recipient households. This reflects the extremely small amounts transferred through these programs as well as the fact that the amounts do not typically take account of household size (see Table 4.14 below). Similar findings hold for 2005.

Table 4.10: Public transfers as a Share of Household Expenditures by Expenditure Deciles, 2014

Decile	All households			Recipient Households		
	Pension	Social Assistance	SWF	Pension	Social Assistance	SWF
<b>Gross Expenditure</b>						
1 (poorest)	0.019	0.035	0.032	0.428	0.093	0.091
2	0.025	0.028	0.024	0.380	0.071	0.067
3	0.032	0.023	0.020	0.403	0.059	0.056
4	0.022	0.020	0.019	0.366	0.052	0.052
5	0.018	0.014	0.013	0.305	0.044	0.044
6	0.027	0.014	0.011	0.314	0.045	0.039
7	0.035	0.010	0.009	0.341	0.034	0.033
8	0.029	0.009	0.008	0.282	0.035	0.032
9	0.029	0.007	0.005	0.258	0.030	0.028
10	0.032	0.003	0.002	0.244	0.019	0.017
<b>Net Expenditure</b>						
1 (poorest)	0.170	0.048	0.040	0.683	0.107	0.095
2	0.048	0.029	0.025	0.390	0.071	0.067
3	0.031	0.023	0.021	0.333	0.055	0.055
4	0.024	0.019	0.016	0.295	0.049	0.046
5	0.019	0.013	0.012	0.300	0.042	0.043
6	0.017	0.012	0.010	0.213	0.038	0.035
7	0.016	0.009	0.009	0.189	0.033	0.034
8	0.016	0.007	0.006	0.199	0.030	0.029
9	0.016	0.006	0.005	0.186	0.028	0.026
10	0.009	0.003	0.002	0.107	0.017	0.016
Total	0.028	0.013	0.011	0.298	0.046	0.044

Note: World Bank staff estimates using data from the 2014 HBS. All statistics are population weighted. All households refer to all households regardless of whether they receive a transfer. Recipient households only include those receiving a transfer. Expenditure is per capita and deflated spatially. Net expenditure is calculated as total household expenditure minus the transfer amount. Population deciles are calculated using total and net expenditures per capita respectively. Statistics in the table give average transfers as a share of total expenditure for each decile. Pensions include the public authority for social insurance, public institution for insurance, military and police pensions, and other pension programs. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, Cash for work, Disability fund, school feeding program, emergency food distribution, and other in-kind programs. SWF refers to Social Welfare Fund. Charity and Zakat are not included.

Table 4.11: Public Transfers Received as a Share of Household Expenditure, 2005/06

Decile	All households			Recipient Households		
	Pension	Social Assistance	SWF	Pension	Social Assistance	SWF
<b>Gross Expenditure</b>						
1 (poorest)	0.033	0.022	0.020	0.198	0.103	0.101
2	0.033	0.014	0.011	0.184	0.067	0.061
3	0.022	0.013	0.011	0.157	0.058	0.056
4	0.032	0.008	0.007	0.178	0.048	0.046
5	0.025	0.012	0.009	0.148	0.057	0.046
6	0.030	0.009	0.008	0.201	0.054	0.054
7	0.029	0.005	0.005	0.171	0.038	0.036
8	0.031	0.006	0.005	0.181	0.050	0.046
9	0.028	0.003	0.003	0.174	0.034	0.032
10	0.032	0.002	0.001	0.176	0.031	0.026
<b>Net Expenditure</b>						
1 (poorest)	0.132	0.033	0.028	0.382	0.124	0.111
2	0.042	0.015	0.013	0.192	0.068	0.065
3	0.043	0.012	0.010	0.211	0.052	0.049
4	0.029	0.010	0.009	0.153	0.051	0.048
5	0.026	0.008	0.007	0.152	0.043	0.041
6	0.017	0.006	0.006	0.132	0.042	0.039
7	0.021	0.006	0.005	0.143	0.044	0.042
8	0.019	0.003	0.003	0.133	0.036	0.034
9	0.020	0.003	0.003	0.139	0.032	0.031
10	0.014	0.002	0.001	0.104	0.029	0.024
Total	0.030	0.007	0.006	0.176	0.053	0.050

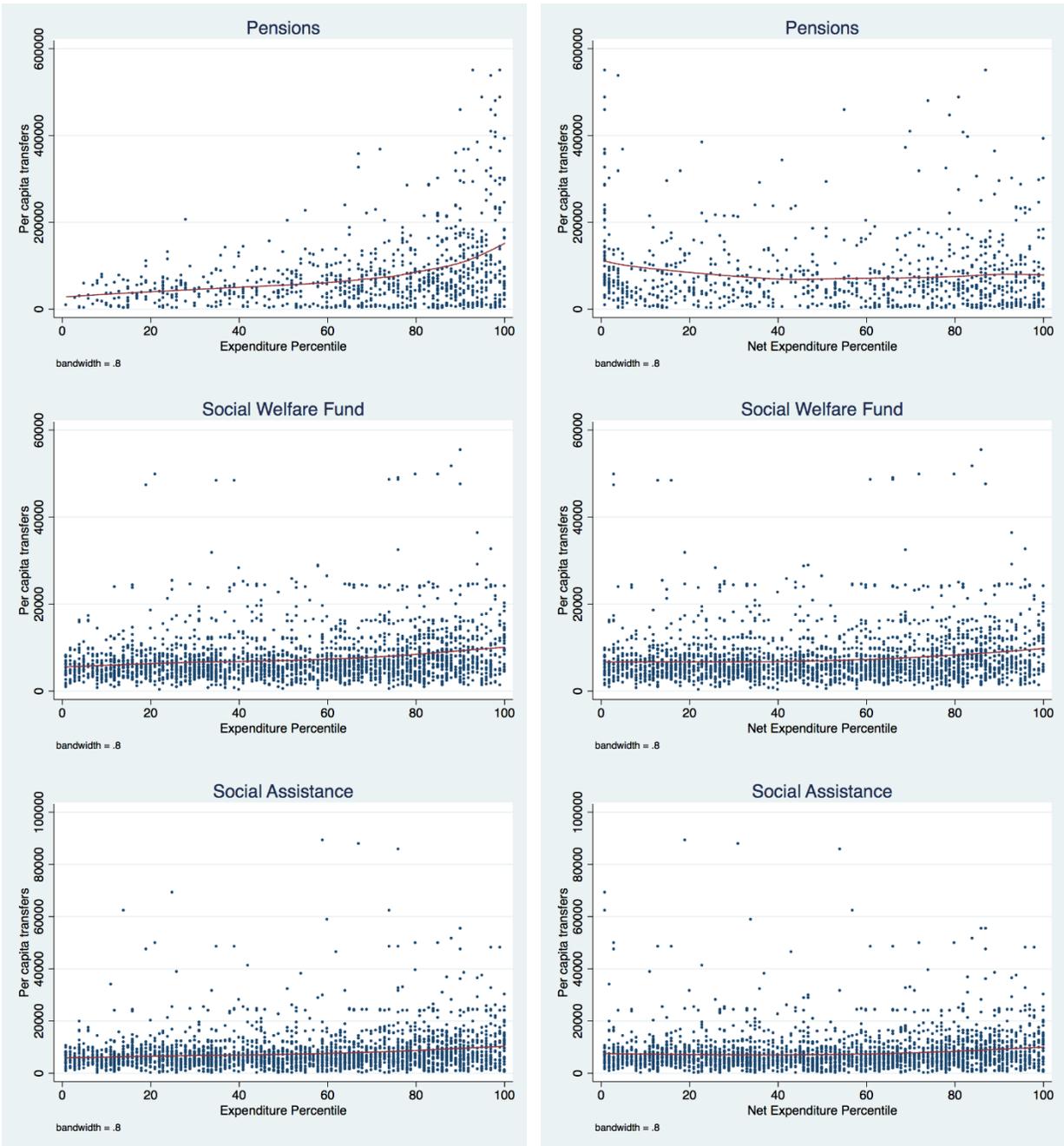
Note: World Bank staff calculations using the data from the 2005/06 HBS. All statistics are population weighted. All households refer to all households regardless of whether they receive a transfer. Recipient households only include households who receive a transfer. Expenditure is in per capita and deflated spatially. Net expenditure is calculated as total household expenditure minus the transfer amount. Deciles are calculated using total and net expenditure respectively. The number in the table is the average transfer share of total expenditure for each decile. Pensions include pensions and the Social Security Fund. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, international & local assistance, Disability fund, and Agriculture and fishery promotion fund. SWF refers to the Social Welfare Fund. Charity is not included.

Figures 4.3 and 4.4 plot how transfer amounts vary by gross and net population expenditure percentiles for 2014 and 2005, respectively. Whether using gross or net deciles, SWF and social assistance transfers more generally, are flat across the entire distribution of living standards. For the SWF, there even appears to be a small uptick for the highest percentiles. When using net expenditure percentiles, pension transfers are slightly more pro-poor. No changes in these patterns are apparent over time. Figures 4.5 and 4.6 do the same for specific household types, namely those with children under 5 and those with female heads. Again, the same patterns emerge: poorer households do not receive disproportionately larger transfer amounts than richer households. Indeed, if anything, better off FHHs are receiving slightly larger transfers (the line is upward sloping).

Figure 4.3: Per Capita Transfers by Gross and Net Expenditure Percentiles, 2014

**a) Gross expenditure percentiles**

**b) Net expenditure percentiles**

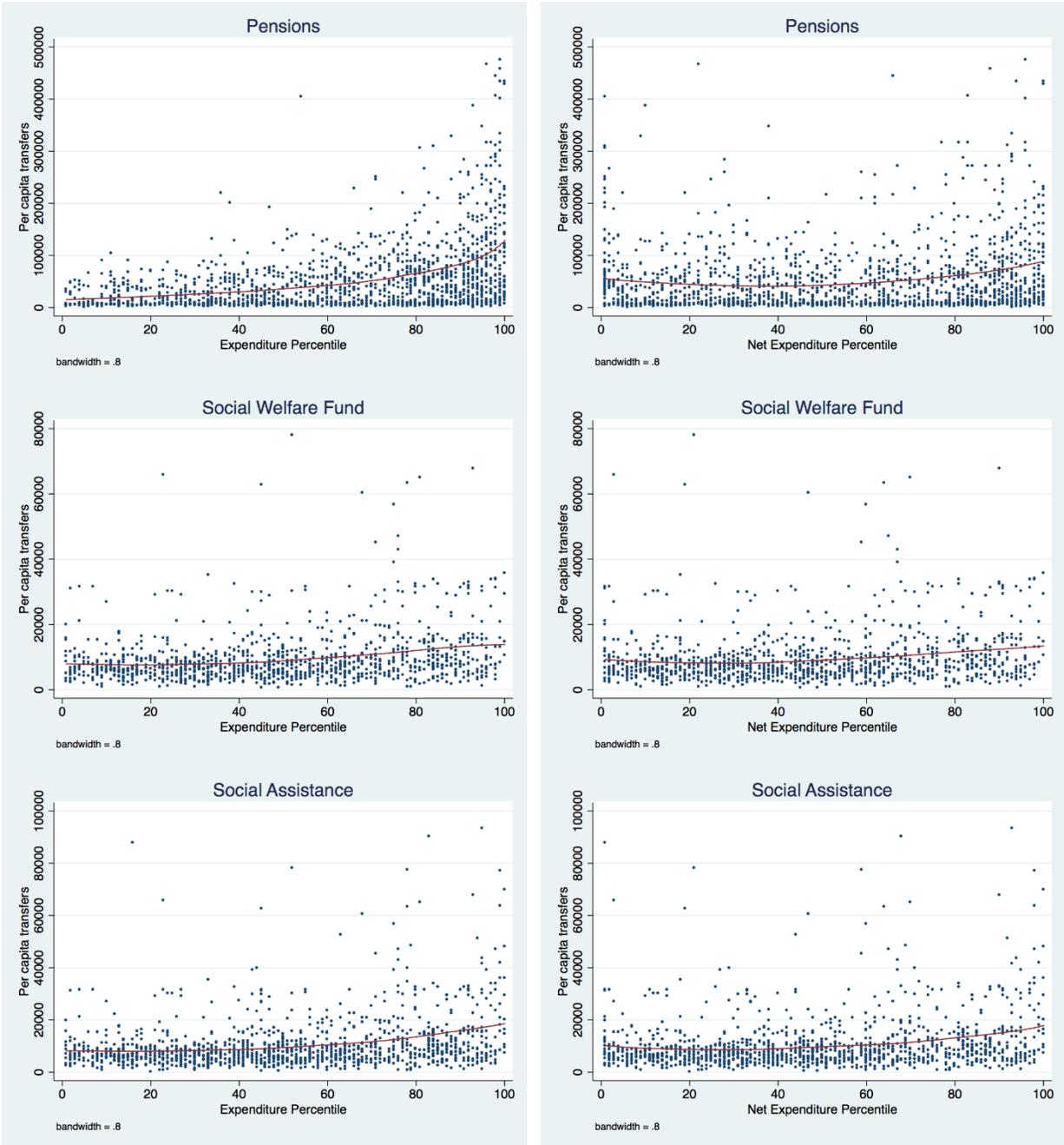


Note: World Bank staff calculations using the data from the 2014 HBS survey. Expenditures are per capita and deflated spatially. Currency is 2014 riyals. Transfers are per capita over all household members. The population is ranked into percentiles of total household expenditures per capita (inclusive of transfers for the column on the left and exclusive of transfers for the column on the right). Pensions include the public authority for social insurance, public institution for insurance, military and police pensions, and other pension programs. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, Cash for work, Disability fund, school feeding program, emergency food distribution, and other in-kind programs. Charity and Zakat are not included.

Figure 4.4: Per Capita Transfers by Gross and Net Expenditure Percentiles, 2005/06

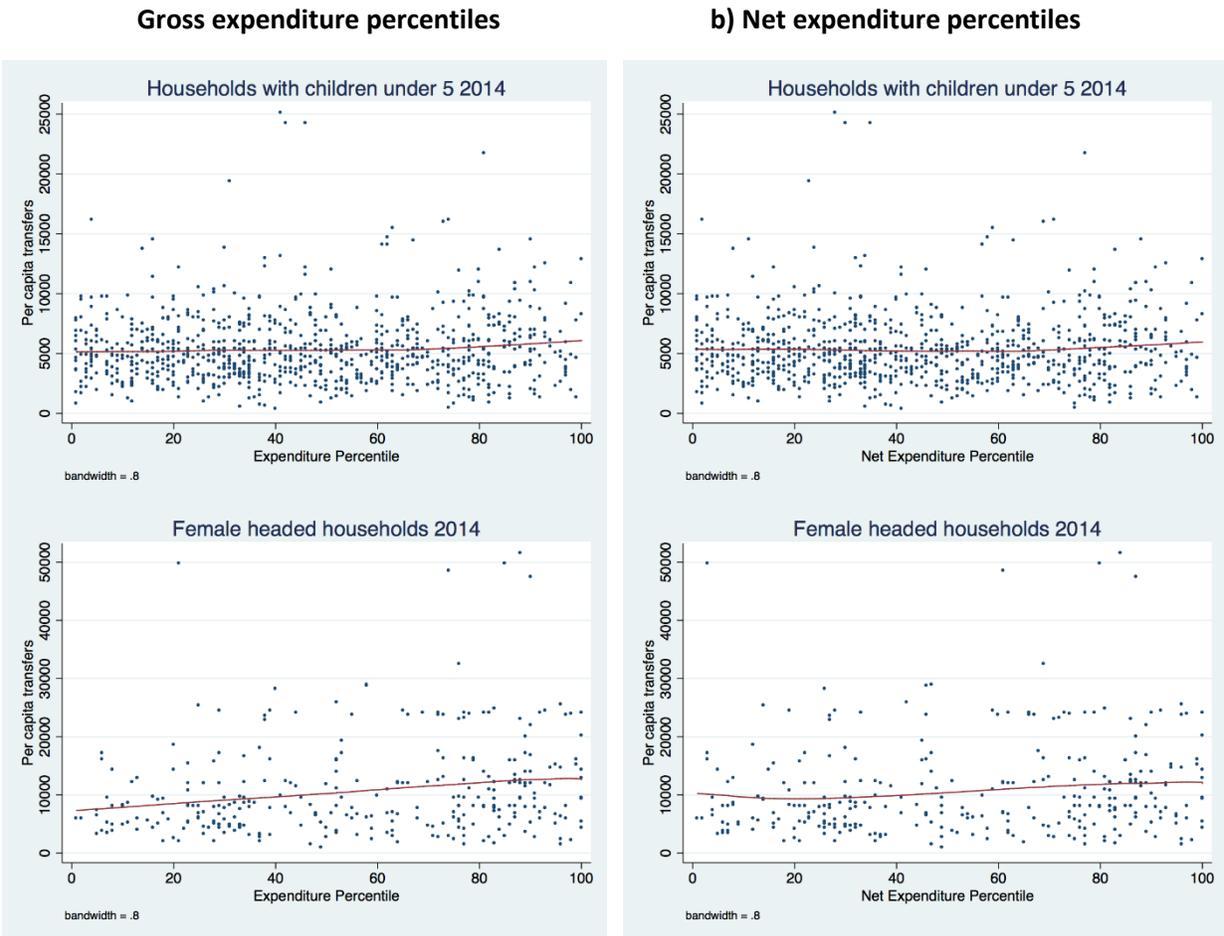
a) **Gross expenditure percentiles**

b) **Net expenditure percentiles**



Note: World Bank staff calculations using the data from the 2005/06 HBS survey. Expenditures and transfers are per capita and deflated spatially. Currency is 2014 riyals. The population is ranked into percentiles of total household expenditure per capita (inclusive of transfers for the column on the left and exclusive of transfers for the column on the right). Pensions include pensions and the Social Security Fund. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, international & local assistance, Disability fund, and Agriculture and fishery promotion fund. Charity is not included.

Figure 4.5: Social Welfare Transfers by Gross and Net Expenditure Percentiles, 2014

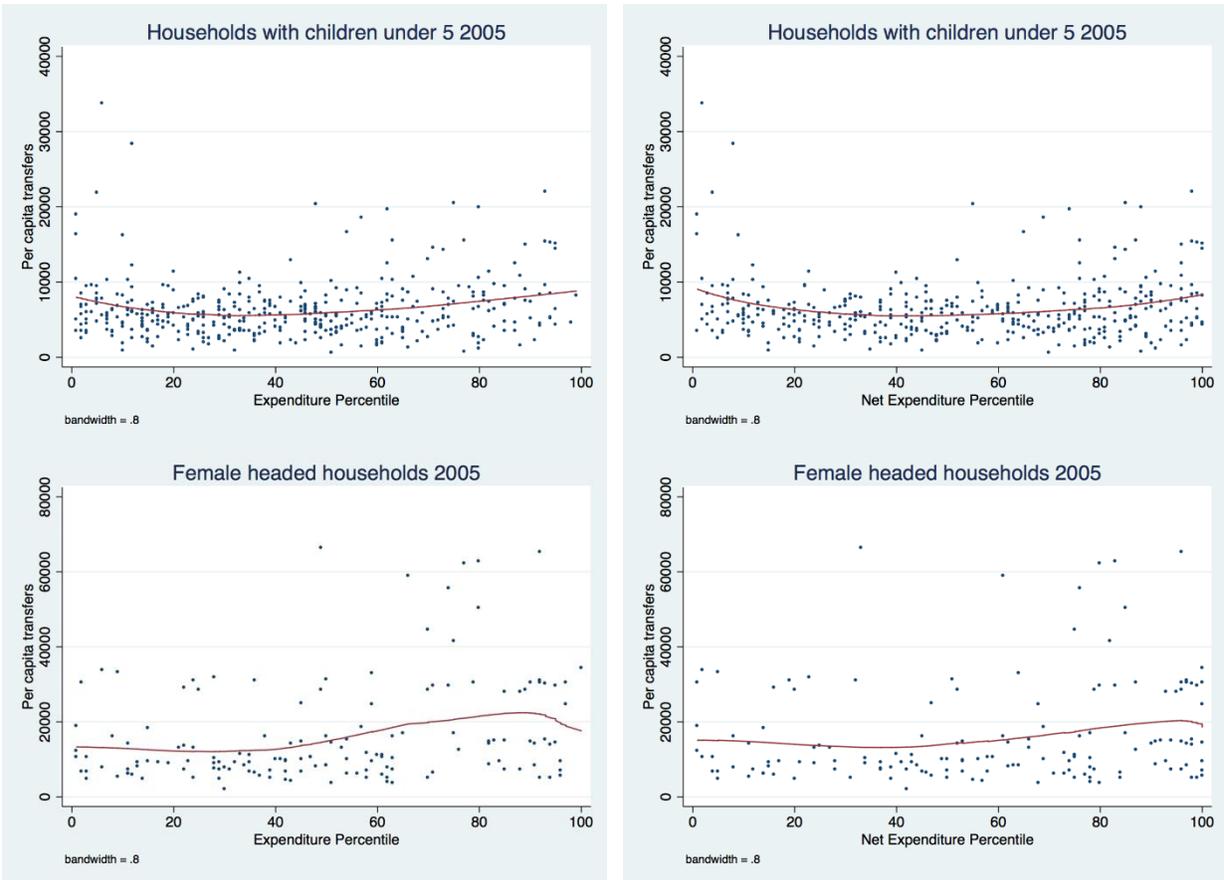


Note: World Bank staff calculations using the data from the 2014 HBS survey. Expenditures and transfers are per capita and deflated spatially. Currency is 2014 riyals. The population is ranked into percentiles of total household expenditures per capita (inclusive of transfers for the column on the left and exclusive of transfers for the column on the right).

Figure 4.6: Social Welfare Transfers by Gross and Net Expenditure Percentiles, 2005/06

**a) Gross expenditure percentiles**

**b) Net expenditure percentiles**



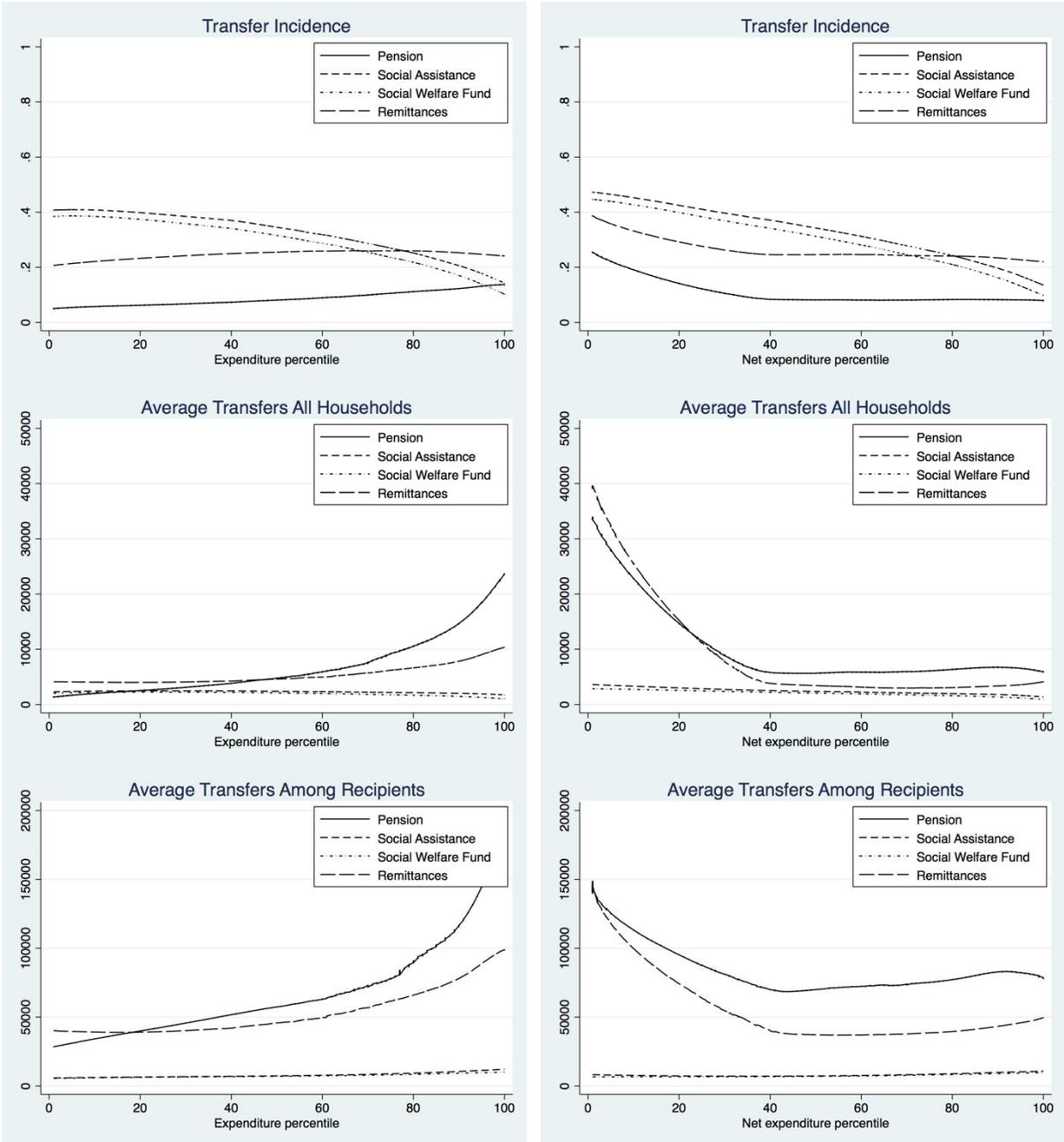
Note: World Bank staff calculations using the data from the 2005/06 HBS survey. Expenditures and transfers are per capita and deflated spatially. Currency is 2014 riyals. The population is ranked into percentiles of total household expenditures per capita (inclusive of transfers for the column on the left and exclusive of transfers for the column on the right).

Figure 4.7 plots the transfer incidence and transfer amounts by gross and net expenditure percentiles for pensions, social assistance and the SWF for 2014 and follow generally what was seen in Tables 4.8 and 4.10. Transfer incidence is reasonably pro-poor for net expenditure percentiles for all categories of transfers, though the lines for pension and remittances flatten out quite quickly. Pension transfer receipts in particular seem to be very high for the poorest percentiles, while transfers for the social programs are small and vary little across the distribution.

Figure 4.7: Transfer Incidence and Average Transfer Amounts by Gross and Net Expenditure Percentiles, 2014

a) Gross expenditure percentiles

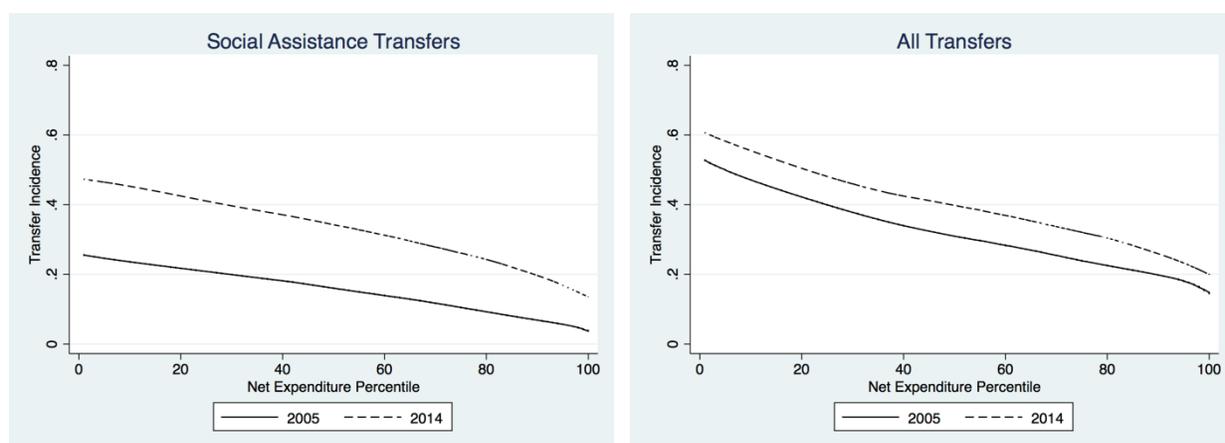
b) Net expenditure percentiles



Note: World Bank staff calculations using the data from the 2014 HBS survey. Expenditure is per capita and deflated spatially. Currency is 2014 riyals. Transfers are per capita over all household members. The population is ranked into percentiles of total household expenditures per capita (inclusive of transfers for the column on the left and exclusive of transfers for the column on the right). Pensions include the public authority for social insurance, public institution for insurance, military and police pensions, and other pension programs. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, Cash for work, Disability fund, school feeding program, emergency food distribution, and other in-kind programs. Charity and Zakat are not included. Remittances include those from both within Yemen and outside Yemen.

Figure 4.8 compares the incidence of transfer receipt by net expenditure percentiles between 2005 and 2014 for social assistance transfers and more generally, all transfers. Though 2014 has a higher average transfer incidence across percentiles, both years follow the same general downward trend, suggesting that transfer receipt incidence is skewed towards the poor (the higher incidence in 2014 is possibly due to the 2014 survey including more programs in the questionnaire).

Figure 4.8: Transfer Incidence by Net Expenditure Percentiles Over Time



*Note:* World Bank staff calculations using the 2005/06 and 2014 HBS surveys. Social assistance in 2014 includes the Social Welfare Fund, Fund for Martyrs & Wounded, Cash for work, Disability fund, school feeding program, emergency food distribution, and other in-kind programs. Charity and Zakat are not included. Social assistance in 2005 includes the Social Welfare Fund, Fund for Martyrs & Wounded, international & local assistance, Disability fund, and Agriculture and fishery promotion fund. Charity is not included. All transfers includes pensions, social assistance, and employment programs. Pensions in 2014 include the public authority for social insurance, public institution for insurance, military and police pensions, and other pension programs. Pensions in 2005 include pensions and the Social Security Fund. Employment schemes in 2014 include temporary employment through public works project (PWP), Productive Family Program, skills training with the Ministry of Vocational Training, and skills training through NGOs. Wealth percentiles are calculated net of transfers. Transfer incidence refers to the percentage of households at each wealth percentile who are receiving transfers from at least one program.

In Table 4.12, some descriptive statistics are given for households who have disabled or chronically ill household heads by sector and gender of the head. On average, 9% of households report having a disabled head, while almost 30% of households list the head as chronically ill (this is self-reported). There seems to be little difference in the incidence of disabled heads across the different types of households, though urban and FHHs are more likely to have a chronically ill head. Interestingly, these households are no more likely to receive support from the disability fund than the general population (0.5%). They are slightly more likely to receive a pension than the general population, and much more likely to receive a transfer from the Social Welfare Fund (36% as compared to 29% nationally).

Table 4.12: Descriptive Statistics for Households with Disabled or Chronically Ill Household Heads

	Sector		Gender of Head		National
	Rural	Urban	Male	Female	
Population with disabled head	0.094	0.092	0.093	0.098	0.093
Population with chronically ill head	0.258	0.330	0.269	0.402	0.279
<b>Characteristics of head</b>					
Urban			0.329	0.403	0.337
Female	0.085	0.114			0.095
Age	53.35	53.56	53.39	53.70	53.42
Years of education	9.34	10.50	9.92	8.03	9.86
Married	0.919	0.885	0.972	0.298	0.908
Divorced	0.006	0.014	0.004	0.048	0.008
Widowed	0.067	0.093	0.016	0.645	0.076
Never married	0.009	0.008	0.008	0.010	0.008
<b>Household welfare</b>					
Total expenditure	150,560	289,222	195,968	208,589	197,164
Mean net expenditure percentile	42.65	66.81	50.73	51.11	50.80
Mean gross expenditure percentile	42.87	68.45	51.31	52.96	51.47
<b>Household-level Support</b>					
<i>Pensions</i>					
Public authority for social insurance	0.024	0.099	0.043	0.104	0.049
Public institution for insurance	0.002	0.013	0.005	0.008	0.005
Military and police pension scheme	0.042	0.073	0.053	0.048	0.053
Other pension program	0.014	0.009	0.014	0.002	0.012
<i>Social assistance</i>					
Social Welfare Fund	0.413	0.250	0.347	0.448	0.358
Fund for Martyrs and wounded	0.001	0.002	0.001	0.001	0.001
Disability fund	0.003	0.010	0.005	0.004	0.005
School feeding program	0.007	0.003	0.005	0.003	0.005
Emergency food distribution	0.036	0.014	0.030	0.017	0.029
Other in-kind program	0.054	0.009	0.040	0.036	0.039

Note: World Bank staff calculations using the data from the 2014 HBS. Total expenditure is annual, per capita and spatially deflated. Currency is in 2014 riyals. Net expenditure percentiles are calculated using total expenditure minus all transfers. Gross expenditure percentiles are calculated using total expenditure inclusive of transfers. Household-level support refers to the proportion of households with a disabled or chronically ill head who receive support.

## Lessons for Social Protection Policy?

The data provide insights on a number of specific questions with bearing on future policy.

### Are the actual beneficiaries of the SWF those intended as the target group?

Table 4.13 looks more closely at the targeting for the Social Welfare Fund by comparing actual participation with various targeting criteria. Hence, the 'target group' is defined by whether household per capita expenditures net of SWF transfers fall below poverty lines delineating 20 and 40 percent of the population, the national poverty line and 155% of the national poverty line. Also considered is targeting among female headed households.

For each target group, Table 4.13 shows the poverty rate, the share receiving SWF transfers, exclusion and inclusion errors, the SWF transfers as a percentage of food and total household per capita

expenditures net of the same transfers, and the average poverty gap with and without the SWF transfers. As the target group expands from the poorest 20% of the population to the population falling below 1.55 times the poverty line, equal to the bottom 75% of the population, the share of the target group receiving SWF rises from 7.4% to 24.8%. The exclusion errors hover around the mid-60s, while the inclusion rate drops from 75% to 15%. The transfer amounts never surpass 15% of food expenditures or 7.5% of total expenditures. The very small value of the transfers is underlined by the small impacts made by the transfers on each group's poverty gap. The numbers look similar when considering female headed households.

These results suggest that while targeting of the SWF appears to be somewhat pro-poor, there is still much work to be done. In particular, the poorest households are being excluded from the program, as evidenced by the relatively unchanging exclusion error rate.

Table 4.13: Estimated SWF Target Population and Coverage in 2014 (%)

	Female headed households					
	Poorest 20% of population (104,388)	Poorest 40% of population (143,144)	National poverty line (162,528)	1.55 times poverty line (251,918)	National poverty line (162,528)	1.55 times poverty line (251,918)
Poverty	20%	40%	48.6%	75.2%	30.9%	53.9%
SWF Yes	7.4%	14.7%	17.3%	24.8%	22.8%	44.8%
Exclusion error	63.0%	63.3%	64.3%	67.0%	56.8%	60.8%
Inclusion error	74.7%	49.7%	40.5%	14.7%	34.9%	17.5%
SWF transfers as % of food expenditures (net)	14.8%	13.4%	12.8%	11.4%	13.6%	13.0%
SWF transfers as % of total expenditures (net)	7.5%	6.1%	5.7%	4.9%	6.9%	6.4%
Poverty gap index pre-transfer	0.052	0.120	0.160	0.331	0.180	0.348
Poverty gap index post-transfer	0.048	0.116	0.155	0.326	0.172	0.341

*Note:* World Bank staff estimates using the data from the 2014 HBS. All statistics are population weighted. Poverty lines (in parentheses) are in annual per capita 2014 YR. The target group is the total population or the female headed households falling below each of the poverty lines considered. Exclusion errors refer to the proportion of the population who is considered poor but does not receive a transfer. Inclusion errors refer to the proportion of the population considered non poor that receives a transfer. Food expenditures and total expenditures are net of the SWF transfer. SWF transfers as % of expenditures is the average transfer share amount for the target group. The poverty gap index pre-transfer is calculated as the average difference between the poverty line and expenditures per capita minus the SWF transfer amount (per capita). The poverty gap index post-transfer is calculated as the average difference between the poverty line and expenditures per capita inclusive of the SWF transfer amount.

## Do transfers favor smaller households?

It is plausible that pensions favor smaller households but is that also true for other transfers? Table 4.14 presents regressions of pension, SWF and total social assistance transfers per capita on log household per capita expenditures alone and then with controls for log household size as well. As one might expect, higher household per capita living standards are associated with higher pension transfer amounts, while it is the opposite with respect to social assistance transfers. At given per capita consumption levels, larger households receive less on average per capita for all transfers considered. While including household size reduces the coefficient on the expenditure variable(s) somewhat, the magnitude and significance remain strong. When examined over the entire population, social assistance transfer amounts fall as per capita living standards rise. This does not appear to apply to social transfers examined among beneficiaries only. Here, higher per capita consumption appears to be associated with somewhat higher transfer amounts (although the coefficients are no longer statistically significant). The negative relationship with household size remains, again indicating that transfers favor smaller households at given household per person consumption expenditure levels.

Table 4.14: Economies of Scale in Transfers, 2014

	Pension			Social Assistance			Social Welfare Fund		
	All Household		Beneficiaries	All Household		Beneficiaries	All Household		Beneficiaries
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log expenditure	8475.870*** (669.755)	7107.094*** (706.994)	30799.709*** (5934.560)	-253.323** (98.482)	-784.032*** (102.779)	461.817 (283.655)	-452.101*** (67.187)	-871.176*** (69.797)	48.530 (141.993)
Log household size		-5120.932*** (860.593)	-82094.877*** (6601.958)		-1985.514*** (125.108)	-7614.069*** (311.724)		-1567.862*** (84.961)	-7034.219*** (153.185)
Constant	-96300.879*** (8247.145)	-70073.219*** (9337.747)	-1.430e+05* (80296.816)	5363.462*** (1212.671)	15532.582*** (1357.468)	16974.516*** (3669.333)	7425.289*** (827.320)	15455.342*** (921.857)	20411.369*** (1827.276)
R <sup>2</sup>	0.017	0.021	0.251	0.001	0.027	0.205	0.005	0.040	0.493
N	9352	9352	877	9352	9352	2654	9352	9352	2375

Note: World Bank staff estimates using the data from the 2014 HBS. Expenditures and all transfers are per capita and deflated spatially. Regressions estimated using OLS. All regression coefficients on log expenditure are statistically significantly different from the coefficients on log household size. Beneficiaries refer to households who receive transfers. Pensions include the public authority for social insurance, public institution for insurance, military and police pensions, and other pension programs. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, Cash for work, Disability fund, school feeding program, emergency food distribution, and other in-kind programs. Charity and Zakat are not included.

Could the results in Table 4.14 reflect economies of scale in household consumption? We can answer this by postulating that it is not consumption per capita ( $Y/N$ ) that determines welfare but  $Y/N^\theta$  where  $0 \leq \theta \leq 1$ . The parameter  $\theta$  reflects economies of scale. These are max when  $\theta = 0$  and min when  $\theta = 1$ . Then the coefficient on  $\ln N$  in Table 4.14 can be interpreted as  $(1-\theta)\beta$  where  $\beta$  is the coefficient on  $\ln Y/N$ . However, the coefficients on  $\ln N$  in Table 4.14 are too large for this to be attributed to economies of scale since the implied values of  $\theta$  are negative.

#### Are Female headed households treated differently?

Table 4.15 examines whether households headed by women are treated differently by the social protection system. Controlling for per capita consumption, female headed households are more likely to be transfer beneficiaries and to receive higher transfer amounts whether from pensions or social assistance transfers. This remains true when controlling also for household size. These results no doubt reflect the many surviving spouses receiving pensions and the fact that FHHs are prominent in the SWF's target group.

Table 4.15: Transfers and Gender of Household Head, 2014

	Transfer Indicator						Transfer Amount					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Pension		Social Assistance		SWF		Pension		Social Assistance		SWF	
Female head	0.073*** (0.010)	0.093*** (0.010)	0.082*** (0.015)	0.105*** (0.015)	0.069*** (0.014)	0.093*** (0.015)	10306.337*** (1419.938)	8825.315*** (1457.843)	1989.863** *	1302.934*** (211.920)	1633.349** *	1094.401*** (143.761)
Log per capita expenditure	0.033*** (0.005)	0.047*** (0.005)	0.114*** (0.007)	0.098*** (0.007)	0.119*** (0.007)	0.102*** (0.007)	8336.364*** (668.188)	7317.058*** (706.502)	-280.258*** (98.051)	-753.034*** (102.701)	-474.210*** (66.747)	-845.139*** (69.669)
Log household size		0.053*** (0.006)		0.062*** (0.009)		0.064*** (0.009)		-3888.479*** (882.755)		-1803.559*** (128.322)		-1415.029*** (87.050)
Constant	0.322*** (0.057)	0.593*** (0.065)	1.683*** (0.086)	1.366*** (0.098)	1.712*** (0.083)	1.386*** (0.095)	95673.175*** (8224.900)	75847.918*** (9368.686)	5484.654** *	14680.029** *	7524.768** *	14739.238** *
R <sup>2</sup>	0.012	0.020	0.030	0.035	0.034	0.039	0.022	0.024	0.010	0.031	0.019	0.046

Note: World Bank staff calculations using the data from the 2014 HBS. Expenditure is per capita and deflated spatially. Indicator variables are equal to 1 if a household receives a transfer and zero otherwise. Transfer amounts are per capita and deflated spatially. Regressions estimated using OLS. N = 9376. Pensions include the public authority for social insurance, public institution for insurance, military and police pensions, and other pension programs. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, Cash for work, Disability fund, school feeding program, emergency food distribution, and other in-kind programs. SWF refers to Social Welfare Fund only. Charity and Zakat are not included.

Should FHHs receive disproportionately more transfers? The issue of whether FHHs are poorer than MHHs is examined in Table 4.16. Here log per capita household expenditures are first regressed on a sole indicator of either female headship or widow headship. For rural areas, the coefficients are statistically insignificant. However, given that in Yemen as elsewhere, FHHs tend to be smaller than MHHs (Table 4.1). If there are economies of scale in consumption, using consumption per person to indicate a household's living standards will tend to exaggerate the poverty of larger (male-headed) households. The second regressions test this by also including a control for log household size. For rural Yemen, the coefficients on the welfare indicator are now highly significant, negative and large. These results suggest that, unconditionally, but allowing for scale economies, rural FHHs are on average 20% poorer than MHHs. Those with a widowed female head appear to fare worse off than the others. However, other characteristics of these households may account for these results. Additional covariates, including detailed demographics, head's education, age and age squared, indicators for whether the head has a disability or a chronic illness, number of disabled/chronically ill household members and month of interview and governorate dummy variables, are then added to the regressions.

Conditioning on household and head characteristics, the effect vanishes for FHHs as a whole but remains significant (only at the 10% level) negative and strong (-0.192) for households with a widowed female head. The story is similar in urban Yemen although in all cases the estimated parameters on female headship are smaller. Thus, not conditioning on the head's own and their households' characteristics, FHHs are poorer in both rural and urban Yemen. Those headed by a widow are particularly disadvantaged. Once differences in attributes are accounted for, these data suggest no significant difference between male and female headed households. FHHs are thus worse off due to their inferior human capital and other attributes as reflected in the values taken by the control variables. As long as these attributes do not improve, social assistance transfers should be targeted to FHHs.

Table 4.16: Are Female Headed Households Poorer? (2014)

	Rural						Urban					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Female head	-0.028 (0.029)	-0.196*** (0.026)	0.074 (0.073)				0.070** (0.032)	-0.066** (0.029)	0.053 (0.036)			
Female widow head				-0.026 (0.042)	-0.210*** (0.035)	-0.192* (0.100)				0.009 (0.038)	-0.111*** (0.035)	0.021 (0.067)
Log household size		-0.308*** (0.019)	-0.327*** (0.036)		-0.295*** (0.018)	-0.333*** (0.035)		-0.427*** (0.018)	-0.446*** (0.022)		-0.426*** (0.019)	-0.450*** (0.023)
Controls	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
R2	0.000	0.085	0.326	0.000	0.080	0.326	0.001	0.119	0.333	0.000	0.120	0.333
N	3487	3487	1890	3487	3487	1890	5889	5889	4236	5889	5889	4236

Note: Data are from 2014 HBS. The dependent variable is log per capita household expenditure deflated spatially and it is regressed on a dummy variable equal to 1 if a household has a female head or a widowed female head and zero otherwise. Regressions are estimated using OLS. Controls include age of head, age of head squared, head has at least primary education, head has at least secondary education, demographic composition of the household, indicators for whether the head has a disability or a chronic illness, number of disabled household members and number of chronically ill household members. Month and governorate are added as dummies.

How much poverty would there be in the absence of private and public transfers? As noted earlier, many Yemeni households rely on income from either remittances or public transfers. There are also likely to be households who rely on both public and private transfers. Table 4.17 compares the overlap between households receiving remittances and households receiving a pension, SWF transfers, any social assistance transfers and private informal charity. Only 2% of households receive both a pension and remittances. 8 and 9% of households benefit from a SWF or any social assistance transfers, respectively, and private remittances. Finally, there is also little overlap between the receipt of private charity transfers and remittances at only 5% of households benefiting from both.

Table 4.17: Share of Population Receiving both Public and Private Transfers, 2014

	Receive private remittances		
	No	Yes	Total
<i>Pension</i>			
No	67.73	22.86	90.58
Yes	7.10	2.32	9.42
<i>Social Welfare Fund</i>			
No	56.06	17.07	73.13
Yes	18.76	8.10	26.87
<i>Social Assistance</i>			
No	53.81	16.20	70.00
Yes	21.01	8.98	30.00
<i>Private informal transfers</i>			
No	63.55	19.84	83.39
Yes	11.27	5.34	16.61
<b>Total</b>	<b>74.82</b>	<b>25.18</b>	<b>100.00</b>

*Note:* World Bank staff calculations using the data from the 2014 HBS. All statistics are population weighted. Remittances include those from both within Yemen and outside Yemen. Pensions include the public authority for social insurance, public institution for insurance, military and police pensions, and other pension programs. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, Cash for work, Disability fund, school feeding program, emergency food distribution, and other in-kind programs. Private informal transfers include Zakat assistance and charity. Remittances include those from both within Yemen and outside Yemen.

Table 4.18 provides estimates of what the poverty rate would be in the absence of transfers and remittances assuming no behavioral responses on the part of households, whether they are beneficiaries or not. Three poverty lines are considered. The first is set at the 20th percentile, such that the poverty rate with transfers or remittances is 20%. The second is set at the 40th percentile. Finally, the national poverty line is considered, giving a baseline headcount index of 48.6%. Removing all public transfers increases the poverty rate at the lowest poverty line by almost 3 percentage points, to 22.5%. If remittances were to fully stop, the poverty rate would be 22%. The relative increase is slightly lower for the higher poverty lines, suggesting that households at the lower end of the welfare distribution are more likely to be affected by a loss of transfers or remittances. With no public transfers or private remittances, the poverty rate jumps to 25, 44, and 52% respectively for the three different poverty lines.

Table 4.18: Poverty Rates without Public and Private Transfers, 2014

	20th Percentile	40th Percentile	National Line
Initial poverty rate	0.200	0.400	0.486
No pension	0.218	0.417	0.500
No Social Welfare Fund	0.207	0.407	0.491
No social assistance	0.208	0.408	0.492
No public transfers	0.225	0.424	0.506
No private informal transfers	0.201	0.403	0.487
No remittances	0.220	0.418	0.503
No public or private transfers (incl. remittances)	0.246	0.441	0.523

*Note:* World Bank staff calculations using the data from the 2014 HBS. Expenditure is per capita and spatially deflated. All statistics are population weighted. Pensions include the public authority for social insurance, public institution for insurance, military and police pensions, and other pension programs. Social assistance includes the Social Welfare Fund, Fund for Martyrs & Wounded, Cash for work, Disability fund, school feeding program, emergency food distribution, and other in-kind programs. Public transfers include pensions, social assistance, and active labor market programs. Active labor market programs include public works program, agriculture & fishery promotion fund, productive family program, skills training government, and skills training NGO. Private informal transfers include Zakat assistance and charity. Remittances include those from both within Yemen and outside Yemen.

[How well do transfers respond to household shocks?](#) Table 4.19 lists the incidence of household-level shocks as reported by urban and rural households and their views on whether these shocks led to a decrease in either income or assets for themselves. For rural households, drought, reduced water availability, and an increase in prices are the most common shocks. Drought led to a reduction in income for 83% of affected households. Reduced water availability and an increase in prices were also common among urban households, as well as increases in violence, which were reported by 30% of urban households.

Table 4.19: Descriptive Statistics for Shocks by Sector

Shock	Rural			Urban			National		
	Incidence	Decrease in income	Decrease in assets	Incidence	Decrease in income	Decrease in assets	Incidence	Decrease in income	Decrease in assets
Drought	0.233	0.826	0.410	0.013	0.784	0.171	0.166	0.825	0.404
Natural disaster	0.037	0.727	0.618	0.008	0.637	0.143	0.028	0.719	0.573
Loss of asset or livestock	0.026	0.771	0.764	0.010	0.393	0.531	0.022	0.702	0.721
Epidemic to livestock	0.037	0.697	0.712	0.002	0.516	0.478	0.026	0.691	0.704
Polluted agricultural water	0.012	0.491	0.299	0.000	0.443	0.000	0.008	0.489	0.285
Crop pests or disease	0.041	0.915	0.446	0.004	0.919	0.455	0.030	0.915	0.446
Reduced grazing areas	0.092	0.711	0.410	0.006	0.703	0.460	0.066	0.711	0.412
Violence outbreak	0.057	0.616	0.155	0.052	0.332	0.137	0.055	0.507	0.148
Violence increase	0.102	0.468	0.097	0.302	0.339	0.102	0.163	0.390	0.100
Repatriated	0.016	0.978	0.365	0.007	0.781	0.316	0.014	0.948	0.357
Influx of IDPs	0.004	0.529	0.000	0.006	0.695	0.065	0.004	0.611	0.032
Forced eviction	0.005	1.000	0.261	0.003	1.000	0.589	0.005	1.000	0.337
Unexpected job loss	0.007	0.950	0.341	0.026	0.980	0.357	0.013	0.969	0.351
Reduction in work hours	0.114	0.974	0.325	0.086	0.958	0.315	0.106	0.970	0.322
Missed wage payment	0.054	0.919	0.312	0.037	0.847	0.238	0.048	0.901	0.294
Marriage ceremony	0.062	0.493	0.411	0.049	0.392	0.132	0.058	0.465	0.334
Loss in remittances	0.045	0.961	0.307	0.017	0.954	0.301	0.037	0.960	0.306
Death of a household member	0.030	0.665	0.315	0.027	0.507	0.235	0.029	0.619	0.291
Injury to household member	0.133	0.522	0.259	0.101	0.648	0.314	0.123	0.553	0.273
Reduced water availability	0.245	0.320	0.087	0.120	0.528	0.133	0.207	0.358	0.096
Human illness	0.037	0.464	0.193	0.023	0.628	0.237	0.033	0.500	0.203
Break-up of household	0.015	0.429	0.227	0.019	0.697	0.382	0.016	0.525	0.282
Increase in prices	0.703	0.516	0.265	0.675	0.458	0.142	0.695	0.499	0.229

Note: World Bank staff calculations using the data from the 2014 HBS. All statistics are population weighted. Decrease in income indicates that a household experienced a decrease in income following the shock. That is, among households who experienced the shock, it is the proportion who report suffering a decrease in income as a result. Decrease in assets indicates that a household experienced a decrease in assets following the shock.

One question is how responsive social assistance programs are to household shocks. Are households who report suffering from some type of shock more likely to be beneficiaries of a social assistance program? Table 4.20 regresses an indicator for whether the household receives a transfer from a social assistance program firstly on the total number of shocks a household reports having experienced during the last 12 months, and secondly on each of the separate shocks reported and captured by the survey. Households who endure more shocks are significantly more likely to receive a transfer from a social assistance program in both rural and urban areas. The correlations are highly significant but small: an additional shock is related to increases in the probability of transfer receipt by 0.04 in rural and 0.03 in urban areas.

For rural households, an influx of IDPs, missed wage payments, a marriage ceremony and injury to a household member are associated with a significantly higher likelihood of receiving a social assistance transfer. For urban households, reduced grazing areas, forced eviction, a reduction in work hours, a marriage ceremony, death or injury of a household member, and an increase in prices are positively associated with receiving aid from social assistance. In a few cases, reporting certain types of shock is associated with a negative probability of receiving transfers in urban areas. For example, this is the case for an influx of IDPs, missed wage payments and unexpected job loss, and water availability and pollution issues.

Table 4.20: Social Assistance and Household Shocks

	Rural				Urban			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total number of shocks	0.038*** (0.009)	0.021*** (0.008)			0.030*** (0.006)	0.034*** (0.006)		
Drought			0.092** (0.035)	0.033 (0.038)			0.090* (0.053)	0.050 (0.051)
Natural disaster			0.032 (0.065)	-0.001 (0.066)			-0.114 (0.090)	-0.040 (0.122)
Loss of asset or livestock			-0.003 (0.059)	-0.002 (0.065)			0.082 (0.067)	0.107* (0.054)
Epidemic to livestock			0.080 (0.059)	0.081 (0.058)			0.261** (0.131)	0.183 (0.123)
Polluted agricultural water			0.054 (0.091)	0.055 (0.115)			-0.120 (0.080)	-0.317*** (0.064)
Crop pests or disease			-0.056 (0.062)	-0.095 (0.059)			0.063 (0.114)	0.068 (0.077)
Reduced grazing areas			0.015 (0.056)	-0.015 (0.046)			0.139* (0.071)	0.140** (0.057)
Violence outbreak			-0.036 (0.058)	0.024 (0.053)			0.037 (0.033)	-0.024 (0.031)
Violence increase			-0.006 (0.041)	0.034 (0.042)			-0.017 (0.016)	-0.008 (0.015)
Repatriated			0.008 (0.064)	-0.069 (0.056)			0.101 (0.078)	0.073 (0.071)
Influx of IDPs			0.218 (0.182)	0.267** (0.131)			-0.203*** (0.070)	-0.107 (0.080)
Forced eviction			-0.104 (0.076)	-0.005 (0.072)			0.222* (0.133)	0.247** (0.109)
Unexpected job loss			-0.018 (0.114)	0.040 (0.100)			-0.089** (0.035)	-0.033 (0.030)
Reduction in work hours			0.006 (0.042)	0.004 (0.040)			0.073*** (0.027)	0.094*** (0.024)
Missed wage payment			0.212*** (0.049)	0.132** (0.050)			-0.117*** (0.035)	-0.060* (0.032)
Marriage ceremony			0.160*** (0.042)	0.088*** (0.032)			0.079*** (0.029)	0.068** (0.028)
Loss of remittances			-0.006 (0.043)	-0.067* (0.035)			0.034 (0.040)	0.003 (0.035)
Death of household member			0.014 (0.050)	0.017 (0.036)			0.104*** (0.035)	0.077** (0.032)
Injury to household member			0.119*** (0.031)	0.086*** (0.027)			0.124*** (0.020)	0.110*** (0.020)
Reduced water availability			-0.014 (0.027)	-0.011 (0.020)			-0.060** (0.026)	-0.047** (0.024)
Human illness			0.008 (0.049)	0.014 (0.041)			0.120** (0.047)	0.076* (0.042)
Break-up of household			-0.121* (0.065)	-0.098 (0.061)			0.041 (0.048)	0.040 (0.042)
Increase in prices			0.019 (0.025)	0.025 (0.026)			0.047** (0.019)	0.067*** (0.016)
Controls	Yes	No	Yes	No	Yes	No	Yes	No
R <sup>2</sup>	0.016	0.182	0.037	0.193	0.007	0.182	0.028	0.197
N	3490	3487	3480	3477	5901	5889	5875	5863

Note: World Bank staff calculations using the data from the 2014 HBS. The dependent variable is an indicator equal to one if the household is receiving a transfer from a social assistance program and zero otherwise. Total number of shocks is the sum of all the shocks listed. Shocks are indicators equal to one if the household has experienced a shock and zero otherwise. Control variables include log household expenditure per capita, log household size, an indicator for female head, and age of head. Regressions estimated using OLS.

## Conclusions

In 2014, on the eve of the current crisis, many Yemeni households relied on public and/or private transfers. This chapter provides an overview of the various public and private transfers that households received in 2014, including the incidence and magnitude of these transfers. Where possible, comparisons are made with transfers in 2005. Many of these transfers disproportionately benefit poorer households including female headed households among them, particularly when households are ranked by net expenditures per capita. There are also signs that some social assistance transfers respond to certain types of shocks. Remittances from within as well as outside the country were particularly critical to household living standards. Government pensions also afforded their few beneficiaries an adequate standard of living. In the absence of these transfers, we expect the national poverty rate to jump up by almost 5 percentage points.

While programs such as the Social Welfare Fund are targeted towards the poor, almost half of SWF recipients are non-poor. And over 60% of the poor do not receive help. There is still work to be done to render the SWF more pro-poor in terms of targeting. However, the key issue with respect to social assistance programs including the SWF, is the tiny size of the transfers. Amounts do not adapt to the household's level of poverty or its number of members. In future reforms, more attention needs to be paid to transfer sizes along with efforts at increasing coverage.

Given the current large scale crisis and rising state of vulnerability in Yemen, the short term priority of donors in the area of social protection and labor should be to build on the existing structures and help adapt, resume and scale-up the major social safety net programs. Among them, the focus should be on the SWF cash transfer, the crisis-interrupted SWF-related cash-for-nutrition program, and the cash-for-works program. These programs can be altered to target the poorest and most vulnerable and be made to reach conflict-affected groups, including IDPs, malnourished women and children, and various groups of the chronic poor.

In the longer-term, the Bank and others donors should support Yemen's Social Protection Program through activities aiming to improve the coverage, targeting and the poverty impact of the social safety net. Reforming these programs to maximize outcomes is likely to require a multi-sectoral human development approach, with the SP, Health, Nutrition and Education sectors joining efforts in the post-conflict period.

## References

Jalan, Jyotsna and Martin Ravallion, 2003. "Estimating the Benefit Incidence of an Antipoverty Program by Propensity-score Matching." *Journal of Business & Economic Statistics*, 21(1), 19-30.

Lackner, Helen, 2017. "Yemen: After Two Years of War A Stupendous Human Crisis Looms" OpenDemocracy

Milazzo, Annamaria and Dominique van de Walle, 2017. "Women Left Behind? Poverty and Headship in Africa." *Demography*, forthcoming.

van de Walle, Dominique, 2002. "Poverty and Transfers in Yemen," Middle East and North Africa Working Paper Series No. 30, World Bank, Washington, DC.

World Bank, 2008. "Yemen: *An Integrated Approach to Social Protection Strategy- Phase I*", and Yemen: *Social Protection Strategy – Phase II*". World Bank, Washington DC.

## Chapter 5 : A Technical Report on National Poverty Update<sup>44</sup>

### Summary

The objective of this chapter is to give an overview of the poverty measurement exercise to estimate national poverty rate in Yemen using the 2014 Household Budget Survey. It gives detailed accounts of three major steps in poverty measurement: constructing a consumption aggregate, setting poverty lines, and poverty analysis. The national poverty rate in 2014 is estimated to be 48.6 percent. Rural poverty rate is 59 percent, significantly higher than urban poverty rate of 24 percent. While changes in survey instruments between the 2005/6 and 2014 HBS make it challenging to compare poverty across time, in all likelihood, all of these estimates indicate a significant increase from 2005/6.

### Introduction

The objective of this chapter is to give an overview of the poverty measurement exercise to estimate national poverty rate in Yemen using the 2014 Household Budget Survey. The report offers a step-by-step description of the key technical decisions made to provide an overall picture of the national poverty update. Annex I and II, respectively, offers sensitivity analysis for the construction of food consumption and alternative scenarios for the estimation of poverty lines and poverty rates. The report, however, does not intend to delineate all the underlying exercises undertaken. Readers who need comprehensive documentation of all the detailed data operations are referred to the set of computer programming files in the form of Stata dofiles available upon request.

### Data Description

The primary data source for this exercise is the 2014 Yemen Household Budget Survey (HBS). The 2014 Yemen HBS is a multi-topic survey that collected information on a wide spectrum of topics including food and non-food consumption, socio-economic and health characteristics, dwelling conditions, labor activities and incomes. The field data work was conducted from January 2014 to December 2014 and the total sample size was 12,790 households. Of those, 27 percent (3,399 households) were panel households that were interviewed in the 2005/6 HBS. The scope of the analysis, however, is limited to the cross sectional sample of 9,391 households due to lack of analytical weights for the panel households at the time of the analysis and the cross sectional sample are designed to be representative at the national level by itself.

In addition, this exercise also utilizes the 2005/6 Yemen HBS where comparisons are necessary across time (See Poverty Lines section and Annex II). Other auxiliary datasets are also used such as the National Nutrient Database maintained by the United States Department of Agriculture (USDA), Consumer Price Index and National Price Survey data provided by the Central Statistics Organization of Yemen.

---

<sup>44</sup> Primary Author: Hiroki Uematsu

## Overview of Poverty Measurement

The standard poverty measurement exercise consists of three major steps: construction of a consumption aggregate, setting poverty lines, and aggregation of poverty measures such as poverty headcount rate. While much of the literature on poverty focuses on the aggregation of poverty measures (Ravallion 1994), this report primarily focuses on the first two steps. Aggregation of poverty measures is discussed at the end in Poverty Analysis.

### Consumption Aggregate

Constructing a consumption aggregate<sup>45</sup> is the first of the three major steps in poverty measurement, followed by construction of poverty lines and analysis of the poor. The consumption aggregate consists of two major components: food and nonfood. In the case of Yemen, the nonfood consumption can be further divided into four sub-categories of durable goods, housing, education and other nonfood items and services. This section explains the process of constructing a consumption aggregate based on the 2014 HBS data. A strong emphasis is placed on food consumption in order to fully utilize the unique questionnaire design as explained below.

#### Food Consumption

Food is the most important component of consumption as it explains approximately half of total consumption for an average Yemenis household in 2014.<sup>46</sup> It has significant implications on welfare analysis because the poor tend to spend a higher share of consumption on food items. The way food consumption is measured, therefore, has an important bearing on the resulting poverty and inequality estimates in Yemen.

The 2014 HBS collects detailed information on food with two separate diary modules, one for food items purchased (purchase module) and the other for food items consumed at home (consumption module). Respondents filled in both diaries every day for a duration of 14 days. The diaries captures consumption and purchases of 128 items that were also collected in the 2005/6 HBS questionnaire.

The two modules are different in scope, as summarized in Table 5.1. The purchase module asks for quantities purchased and associated expenditures while the consumption module asks for quantities consumed, self-produced or received in-kind but not expenditures. In other words, the purchase module has quantities and expenditures of purchased items but no information on from other sources. The consumption module collects consumed quantities of all possible sources of food consumption but has no data on expenditures.

---

<sup>45</sup> Strictly speaking, what is referred to as consumption here is a mix of three concepts: monetary value of food items *consumed*, expenditures of goods and services *purchased*, and monetary value of food items *received* as in-kind. Throughout this report, these concepts are interchangeably used for the sake of brevity unless otherwise noted.

<sup>46</sup> See Figure 5.1.

Table 5.1: Purchase and Consumption Modules in the 2014 HBS

Source	Purchase Module		Consumption Module	
	Expenditure	Quantity	Expenditure	Quantity
Purchases	Available		Not Available	Available
In-kind & Self-production	Not Available		Not Available	Available
128 items in total, of which 20 are broadly defined (e.g., Other Meat)				

The two modules are also different in terms of units of measurement to record quantities (See Table 5.2). In the purchase module, quantities are measured in grams, kilograms, liters, pieces or Riyals.<sup>47</sup> The consumption module allows respondents to report quantities in large cups, medium cups, small cups, large tablespoons, medium tablespoons, small tablespoons in addition to the five above.

Table 5.2: Units of Measurement in Food Diaries in the 2014 HBS

How Quantities are Measured		
Unit of Measurement	Purchase Module	Consumption Module
Grams	Available	Available
Kilo		
Liter		
Pieces		
Riyals (local currency)		
Large Cup	Not Available	
Medium Cup		
Small Cup		
Large Table Spoon		
Medium Table Spoon		
Small Table Spoon		

In order to best exploit this unique questionnaire design, food consumption is estimated by combining the two modules. For each item, quantities consumed in the consumption module are multiplied by unit values estimated in the purchase module, where unit values are defined as expenditures divided by

<sup>47</sup> Riyals are the local currency of Yemen. While this option is redundant in the purchase module where there is a separate question on expenditure, it offers additional flexibility to the respondents in the consumption module in case respondents are unable to provide specific quantities but remembers monetary values for the quantity consumed.

quantities purchased and serve as proxy for prices. The resulting food consumption values are summed across all items to obtain total household food consumption in Riyals.<sup>48</sup>

This approach, however, comes with four practical challenges: (1) how to convert quantities measured in different units into a standard unit (2) how to calculate unit values using the purchase module (3) how to treat seemingly suspicious quantities in the consumption module and (4) how to capture consumption for broadly-defined items (e.g., other meats, other vegetables) for which no unit values can be calculated.

#### *Converting quantities into a standard unit*

Recall that, in the purchase module, quantities are recorded in weights (grams and kilograms), volume (liters), pieces and Riyals. In the consumption module, there are six additional measures (three spoons and three cups) in addition to all the units available in the purchase module. For quantities reported in weights and volume, a table of food density conversion factors constructed from the National Nutrient Database (NND) maintained by the USDA<sup>49</sup> is used to convert original quantities into grams.<sup>50</sup>

In addition, there is a need to estimate an average weight per piece when food quantities are recorded in pieces. This is difficult because there is no such thing as a “standard piece” for many food items considered in this exercise. While some external sources offers an approximate weight per piece of some limited number of items, their relevance to the Yemeni context is unknown and it is not nearly exhaustive enough to cover all the items available in the HBS questionnaire. As a practical remedy, the following steps are taken to estimate median grams per piece using the purchase module data. For each item, calculate 1) median prices per piece and 2) median price per gram. Then divide 1) by 2) to obtain median grams per piece to convert quantities recorded in pieces into grams.

Finally, for about 3 percent of the food consumption data, quantities are not reported and instead monetary value of the consumption is recorded in Riyals. In these cases, the values reported in Riyals are added to the food consumption.

*Calculating unit values in the purchase module:* A unit value is simply expenditure divided by quantity purchased. Although they can be calculated for each purchase record in the purchase module, such “raw” unit values are often prone to errors. A recommended practice is to use median unit values over a certain number of observations. There is no clear theoretical guidance as to what should be the minimum number of observations to calculate median unit values. Setting this threshold too low would result in unit values that are too noisy, while setting it too high would overly smooth out variations in unit values. For practical reasons, a threshold is set such that at least eight observations are used to calculate unit values for an item. For each food item, unit values are calculated at various levels of aggregation: household, PSU,

---

<sup>48</sup> There are two other plausible ways to calculate food consumption. Annex I compares three alternative approaches to estimating food consumption and assesses implications of outlier treatment on food consumption quantities discussed later in this section.

<sup>49</sup> Available at <https://ndb.nal.usda.gov/ndb/>. This is complimented by the FAO/INFOODS Density Database (<http://www.fao.org/docrep/017/ap815e/ap815e.pdf>).

<sup>50</sup> This required matching food items between the HBS 2014 and the NND. In general, for each item in the 2014 HBS, there are many candidate items in the NND in which case a median value of all plausible items are used. A detailed description of the way the food density table is constructed is available upon request.

quarters and stratum, quarters and urban/rural areas, urban/rural areas and finally at the national level and use the one at the lowest aggregation that satisfies the threshold of at least eight observations.<sup>51</sup>

*Outlier treatment in the consumption module:* In the food consumption module, there were non-negligible number of observations where quantities reported are abnormally small or large relative to the unit of measurement reported. While there is no universally accepted method of identifying and correcting for outliers, there is a strong need to treat these suspicious outliers as it will impact the distribution of total food consumption.<sup>52</sup> For practical purposes, the following sequential approaches are adopted to imputing replacement values for suspicious quantities. First, potential outliers are identified if the quantity consumed satisfied one of the following criteria:

- Quantities in weights less than 1 gram or greater than 10 kg
- Quantities in volume greater than 25 liters or less than 1 ml
- Quantities in pieces greater than 25 (99th percentile, unweighted)
- Quantities in spoons/cups less than 0.1 or greater than 100

A total of 28,195 cases, or approximately 1.5 percent of total observations are identified as outliers and more than 4000 households have at least one such case. Note that the consumption module allows respondents to report consumption of a food item multiple times every day. Thus the quantities reported there can be best understood as the amount used in one use, rather than a total of all uses in a given day.

When a household reports consumption of the same item during the diary period, outliers are replaced by the median quantity of the most frequently reported unit of measurement (gram, liter, or piece) reported by that household. When all instances in which the household reports consumption of an item are deemed outliers, the national median quantity of that item in the most frequently reported unit by one of the following household size categories is used (1 to 3 members, 4 to 8 members, or 9 or more members).<sup>53</sup>

*Capturing consumption for broadly-defined items:* There are about 20 food items that are broadly defined such as “Other Grains” and “Other Meat” with the intention to capture consumption quantities of miscellaneous items. Since there is no sensible way to calculate unit values for these broadly-defined food items, expenditures reported on these items in the purchase module are added to total food consumption.<sup>54</sup>

In addition to the item-by-item record of food purchases and consumption described so far, the 2014 HBS diary asks about expenditures on food and beverages for breakfast, lunch and dinner purchased outside

---

<sup>51</sup> Unit values at the household level are used if they are based on more than eight observations. For example, if a household purchased tomatoes more than eight times during the diary period, the median unit value of all tomato purchases for that household will be used.

<sup>52</sup> A comparison of food consumption distributions with and without outlier treatment is available upon request.

<sup>53</sup> Admittedly, the approaches described above are arbitrary and devised out of a need to find a practical solutions to the data issues. Another plausible option is to identify outlier quantities in a standard unit such as grams or caloric values. As discussed later, however, construction of food density conversion and caloric conversion tables required a set of simplifying assumptions and thus may not be most suitable in identifying outlier values.

<sup>54</sup> It is important to note that, for this reason, quantities reported for these broadly defined items in the consumption module is not utilized in calculating food consumption.

of home. Respondents report these expenditures every day. The total expenditure on food and beverages purchased outside are also added to the total household food consumption.

### Nonfood Consumption

The nonfood consumption consists of four sub-categories: (1) education, (2) durable goods, (3) housing, and (4) other nonfood items and services. Health expenditures are not included as they are often regarded as regrettable expenditures, their occurrence are irregular and they are prone to measurement errors (Deaton and Zaidi, 2002).

*Education:* As in health expenditure, one can argue if education expenditures should be included as part of consumption. The most notable case against the inclusion is that education expenses tend to concentrate in certain phases of life cycle as households with school-age children tend to incur more education expenses than others. Education can also be seen as investment in human capital rather than consumption. Yet, unlike health expenditures, education expenditures are less likely to be irregular and thus less prone to measurement errors. Further, in many countries, education expenditures are often positively correlated with the total expenditures and including it helps to identify varying living standard across the population of the interests. For these reasons, the standard recommendation in the literature is to include them in the consumption aggregate (Deaton and Zaidi, 2002).

The 2014 HBS questionnaire asks about a set of clearly defined expenditures on education including kindergarten/nursery fees, all direct expenses (tuition, uniforms, etc.) plus the value of scholarships. A sum of these expenditures are added to the total consumption.

*Durable Goods:* In a standard poverty measurement exercise, consumption of durable goods is treated differently from the other components of nonfood consumption because purchase prices of durable goods do not accurately reflect values of services households receive from durable goods in a given period of time. Durable goods are purchased infrequently and expenditure on durable goods tends to be lumpy. Usable life of durable goods is longer than other nonfood items. For these reasons, the standard practice in the poverty literature is to estimate “user cost” of durables, which is essentially monetary value of flow of services incurred by using durable goods in a given period of time, typically a year (Deaton and Zaidi 2002; Amendola and Vecchi 2014).

This approach cannot be directly implemented because the 2014 HBS questionnaire does not have variables required for calculating user cost of durable goods. It asks for ownership of 34 durable goods and their current values (Table 5.3)<sup>55</sup> but it does not ask for values at the time of purchase and years of ownership. When available data does not allow for the user cost calculation, one practical approach is to exclude durable goods from the consumption aggregate because poverty headcount rate can be robust to the composition of the consumption aggregate under certain conditions.<sup>56</sup>

---

<sup>55</sup> Respondents have an option of adding up to two extra durable items that are not listed in the questionnaire.

<sup>56</sup> See Lanjouw and Lanjouw (2003). Note that other key indicators such as poverty gaps and squared poverty gaps are affected and Gini index is likely to be underestimated

Table 5.3: Durable Goods, Average Ownership and Assumed Usable Life

Durable Goods	Average Ownership (%)			Assumed Usable Life (Years)
	National	Urban	Rural	
Air conditioner	11%	25%	4%	5
Blender or mixer	37%	71%	21%	5
Electrical Fan	20%	38%	12%	5
Electrical Water Heater	12%	23%	7%	5
Internet modem	5%	13%	1%	5
Laptop	8%	18%	2%	5
Mobile Telephone	81%	92%	76%	5
Personal computer	5%	12%	1%	5
Satellite Dish	67%	91%	55%	5
Solar Water Heater	0%	0%	1%	5
Bicycle	4%	7%	2%	10
Electric water pump - owned (not shared)	13%	25%	8%	10
Electrical Generator	14%	22%	11%	10
Gas cylinder	81%	94%	74%	10
Gas or electrical bread oven	54%	56%	53%	10
Gas or electrical Stovetop	73%	86%	67%	10
Motor bike	11%	9%	12%	10
Radio/Cassette Recorder	34%	27%	37%	10
Refrigerator	41%	78%	23%	10
TV	70%	95%	57%	10
Vacuum cleaner	12%	28%	4%	10
Washing Machine	35%	75%	16%	10
Water storage tank (plastic or metal) - owned	50%	47%	51%	10
Electric Iron	26%	59%	10%	15
Large bus	0%	0%	0%	15
Micro or mini bus	1%	2%	1%	15
Mini truck	2%	1%	2%	15
Motor boat	0%	0%	0%	15
Private car	13%	19%	10%	15
Row boat / sail boat	0%	0%	0%	15
Sewing Machine	10%	15%	7%	15
Taxi	2%	3%	1%	15
Truck	1%	1%	1%	15
Weapons (not including jambiyas)	25%	12%	32%	15

Source: World Bank staff calculations using the HBS 2014.

Following Deaton and Zaidi (2002) who describes alternative approaches to imputing user cost of durables with data limitation, the following practical steps are taken. First, classify durable goods into three categories based on assumed average usable life of five years, 10 years and 15 years.<sup>57</sup> Second, divide the current values of durable goods by the assumed years of usable life in order to impute the value of service flow that the households can accrue by owning and utilizing the good for a year. An underlying assumption is that, for a given durable item of similar quality, recently purchased items (and thus a higher current value) will have a higher user cost than items owned for a long time. The imputed user costs are summed across all items to obtain the total value for all households.

*Housing*: Estimating value of housing service is one of the most important and challenging steps in constructing consumption aggregate. A popular approach is to use what may be termed “self-reported rent” whenever this variable is available in the survey. Self-reported rent is the combination of the actual rent reported by renters and owners’ self-assessment of how much it would cost to rent a dwelling like theirs. While this could be a reliable estimate of the value of housing services, measurement error may be prevalent. Owners may face difficulty in providing an accurate response to such a hypothetical question especially if they live in an area where rental housing market is underdeveloped including rural areas in Yemen. An alternative approach is to impute the value of housing services by fitting a hedonic regression model. One of the advantages of the regression approach is its ability to smooth out the distribution of the self-reported rent that are usually prone to measurement errors. Another method is the rent-to-value approach where the ratio of self-reported rent over property value is used to calculate the flow of housing services (Balcazar et al. 2014).

This exercise adopts a combination of the self-reported rent approach and the rent-to-value approach. The self-reported rent payment is used for those who are renting their dwelling and the rent-to-value model for households that own the dwelling. The rent-to-value approach first estimates the median capitalization rate, the ratio of self-reported rent over property value by urban and rural area in each governorate. This is applied to self-reported property values to estimate the flow of housing services for owners.

*Other Nonfood Items and Services*: The 2014 HBS asks for expenditures on a wide range of non-food items, including utilities (e.g. expenses on water, gas and electricity), daily necessity items (detergents, tissues, soap, toothpastes, etc.), transportation, communication, clothing, shoes and other miscellaneous items. Clothing and shoes have a very detailed items lists (44 and 13 items, respectively) to account for different item specifications by gender and age.<sup>58</sup>

The questionnaire asks for expenditures on these items and services as well as monetary values of those received in-kind using three recall periods of 1-month, 3-months and 12-months. A 1-month recall is used for items and services consumed more regularly such as utility payments whereas longer recall periods are used for those less frequently used. Among items reported in Section 19 (expenditure in past 3 months) and Section 20 (expenditure in past 12 months), items considered durable goods (items expected to provide usage for more than a year, such as furniture and appliances) are excluded from the consumption aggregate. Item-level expenditures (and in-kind values) are first annualized depending on the recall period and summed across all items to obtain total expenditure at the household level.

---

<sup>57</sup> This is inevitably arbitrary but this process is conducted with the World Bank staff with the knowledge of Yemen.

<sup>58</sup> For example, there are four items for shoes (men’s shoes, women’s shoes, boys’ shoes and girls’ shoes)

## Spatial Price Adjustments

The fundamental premise of using consumption as a measure of well-being is that two individuals with the same value of consumption experience the same level of living standard. Price adjustments are necessary whenever this premise is in question, for example, when individuals face different prices for the same goods depending on time and locations.

Spatial price adjustments is applied to the nominal consumption aggregate. The resulting consumption aggregate are real in that direct comparisons can be made across space and time. In this exercise a Paasche index is estimated using the unit values estimated from the purchase module and quantities consumed in the consumption module.<sup>59</sup> While the recommendation in Deaton and Zaidi (2002) is to use the spatial price index estimated at the household level, a more common approach in recent years is to use a median or mean of the spatial price index aggregated at a higher level (districts, regions, etc.). Accordingly, median Paasche values by Strata is used (See **Error! Reference source not found.**)<sup>60</sup> This assumes that price levels differ across governorate and across urban/rural areas within each governorate and that variations in food prices across space approximates that in nonfood prices.<sup>61</sup> The total consumption is deflated by the strata-level median Paasche index to adjust for spatial price differences.

Another important dimension of price adjustment is within-survey temporal adjustment during the data collection period. The latest Consumer Price Index (CPI) shared by the Central Statistics Bureau shows an overall inflation rate of 10 percent and a food inflation rate by 6 percent during the HBS data collection period (from January to December 2014). Two versions of consumption aggregate are constructed, one with temporal price adjustment on food consumption within the survey period using the monthly CPI data and the other one without such adjustment. Although the former may be preferable from a theoretical standpoint, the latter approach is adopted for the sake of simplicity and the fact that this choice had little impact on the final poverty estimates.<sup>62</sup>

---

<sup>59</sup> See Gibson (2007) and Deaton (2000) for advantages and disadvantages of Paasche index relative to other popular indices such as Laspeyres and Fisher.

<sup>60</sup> Strata is a combination of Governorate and urban/rural areas. The earlier phase of the exercise used median values by Strata and Quarters but later modified to use Strata level due as per suggestions from the Central Statistics Office.

<sup>61</sup> The latter assumption is contestable but often used due to data limitation. Most household survey data, including the 2014 HBS, captures expenditures on nonfood items but they are too broadly defined to reliably estimate unit values for calculation of price indices. In some countries, sub-national consumer price index may be used, but the CPI data was not available at governorate level in Yemen.

<sup>62</sup> The national poverty rate with the temporal adjustment would have been lower by 0.4 percentage points.

Table 5.4: Median Paasche Index by Strata

Governorate	Urban	Rural
Ibb	1.00	1.00
Abyan	1.00	0.98
Sanaa City	1.04	
Al-Baida	1.05	0.99
Taiz	0.99	0.93
Al-Jawf	1.00	0.99
Hajja	1.01	1.02
Al-Hodeida	1.01	0.99
Hadramout	1.04	1.00
Dhamar	1.02	1.00
Shabwah	0.99	0.99
Saadah	0.97	1.02
Sanaa Region		1.04
Aden	0.98	
Laheg	0.96	0.93
Mareb	1.08	1.10
Al-Mahweet	0.98	0.98
Al-Maharh	1.05	1.07
Amran	0.98	0.98
Al-Dhale	1.00	1.01
Remah	1.02	1.00
Socatra	0.92	0.74

Source: World Bank staff calculations using the HBS 2014.

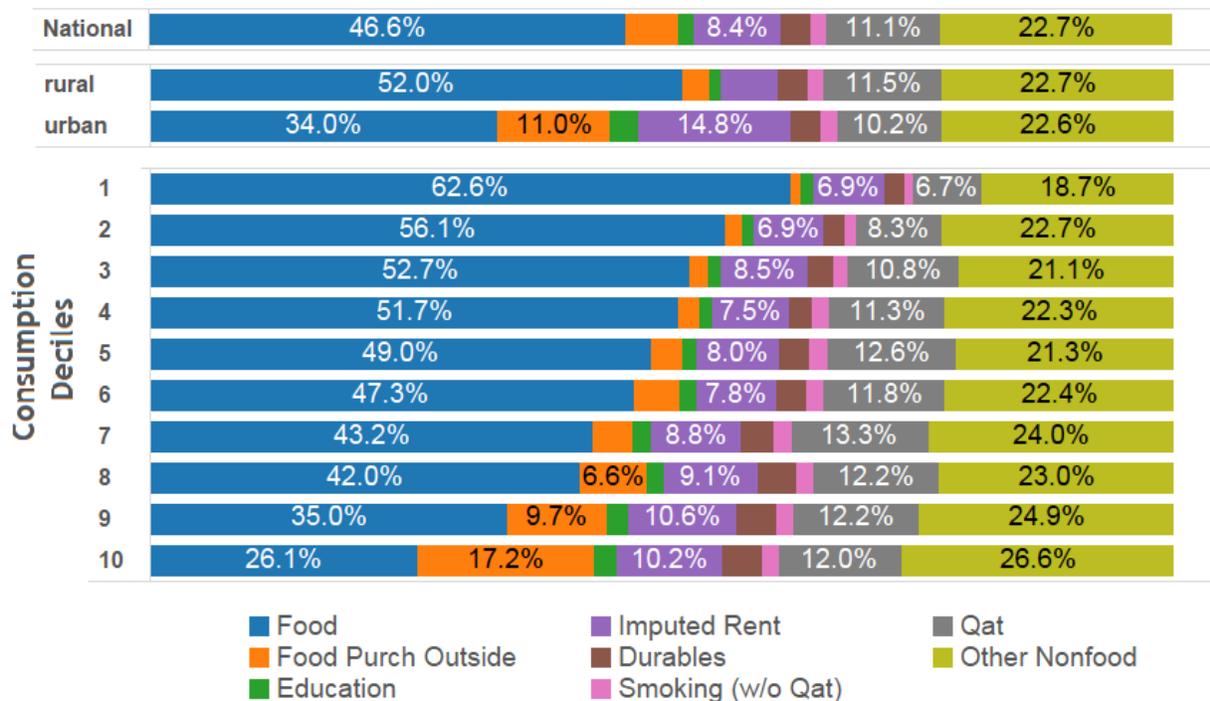
### Total Consumption and Category Shares

To summarize the discussion so far, a consumption aggregate is constructed using data from various sections of the 2014 HBS data: food consumption, nonfood consumption (education, user cost of durables, housing services and general nonfood goods and services). The consumption aggregate is then adjusted for price differences across locations by using a Paasche index based on food data. The total value of consumption aggregated at household level is then divided by household size to obtain per capita consumption.

The median per capita consumption is 166,155 Riyals per year while the mean is 217,071, indicating that the distribution of per capita consumption is highly skewed to the right. An average Yemeni spent a little more than 50 percent of the total consumption on food items and food purchased outside (Figure 5.1). The food share is higher among rural residents (55 percent) than urban residents (45 percent) but urban residents spent 11 percent on food purchased outside compared to only 2.6 percent for rural residents. The food share is also the clearest indicator of overall well-being; the richest 10 percent of the population spent only 26 percent of the total consumption on food items (not including those purchased outside) compared to 63 percent for the bottom 10 percent. In contrast, the richest 10 percent has the highest

share of food purchased outside (17 percent), compared to about 2 percent for the bottom 40 percent on average.

Figure 5.1: Consumption Category Shares



Source: World Bank staff calculations using the HBS 2014.

## Poverty Lines

The second step in poverty measurement is setting poverty lines to classify households into poor and non-poor based on their consumption values. The most common approach to estimating poverty lines is the Cost of Basic Needs approach developed by Ravallion (1998; 1994). Poverty lines under the CBN consists of two components: food poverty line and nonfood allowance. Food poverty line represents a monetary value (in Riyals in this context) required to purchase a basket of food items that satisfies a basic minimum caloric threshold. This basket consists of items commonly consumed by the less well-off segment of the population. The price of the basket is the food poverty line to which nonfood allowance is added to account for the basic minimum needs for nonfood goods and services. The total poverty line is a sum of the food poverty line and the nonfood allowance and anyone whose consumption is below this line is considered poor.

There are three parameters to be defined under the CBN approach: (a) the minimum caloric threshold the basket of food items should satisfy, (b) the reference population to estimate the food poverty line, and (c) the nonfood allowance. The rest of the section explains how these parameters are defined, with reference to the way national poverty was estimated in the past using the 2005/6 HBS data.

### Minimum Caloric Threshold

A minimum caloric threshold of 2,200 kcal per person is used because the same threshold was used in the national poverty update using the 2005/6 HBS data. Note, however, that the national poverty estimate of 34 percent in 2005/6 was not based on the CBN but on a rather unique methodology of household-specific poverty lines. As such the 2014 poverty estimates are not directly comparable to the previous estimates,<sup>63</sup> although a decision is taken to maintain the same caloric threshold as the starting point of both methodologies.

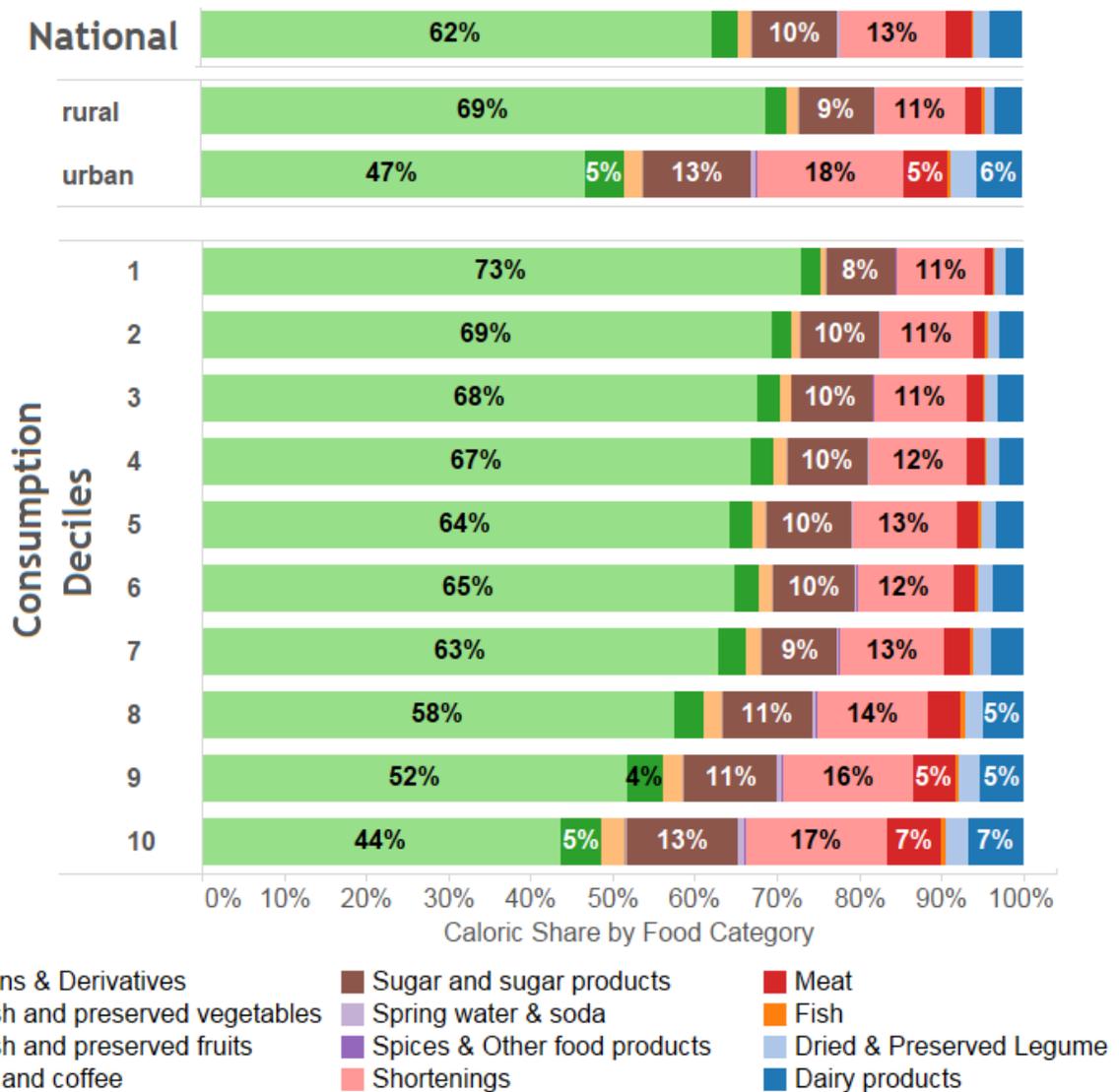
### Reference Population

Once the minimum caloric threshold is determined, the next step is to calculate how much it costs to satisfy that requirement. In standard applications of the CBN, it is recommended to focus on a relatively less-well off segment of the population, such as the 2<sup>nd</sup> to 4<sup>th</sup> decile of the consumption distribution, to do this calculation. This is because the wealthier population often have a notably different and more luxurious food consumption patterns than the rest (Figure 5.2). It is also noteworthy that the focus is on the relative poor, but not the poorest of the poor because the spending patterns of the latter group may not reflect their preferences but rather a consequence of difficult economic decisions out of desperation, which may not be appropriate to define the threshold above which one is deemed non-poor.

---

<sup>63</sup> The previous national poverty estimate of 34 percent was derived from the 2005/6 HBS data based on household-specific poverty lines. See Government of Yemen (2007) for more details, pages 82-86 in particular. While the way food poverty line was calibrated is comparable to the CBN, there is a clear difference in estimating nonfood allowance. In the 2005/6 methodology, each household is assigned a unique poverty line which reflects both household composition and price levels. This is in contrast to the CBN adopted in the current exercise where poverty line estimation is separate from spatial price adjustment. Although conceptually sound, the 2005/6 approach comes with a number of practical limitations. The most notable limitation was that it was not straightforward how to rank households based on nominal consumption. Because different households have different poverty lines, there were cases where Household A has a higher (nominal) consumption than Household B, and at the same time Household A is poor but not Household B. It was also not clear how best to calculate inequality measures. Not having a single poverty line posed a communication challenge. For these reasons, several countries in the Middle East and North Africa region that previously adopted this methodology has switched to the CBN or in the process of adopting the CBN. As such, a decision was taken in consultation with the CSO to adopt the CBN for the current analysis.

Figure 5.2 Caloric Intake Shares by National, Urban/Rural and Consumption Deciles



Source: World Bank staff calculations using the HBS 2014.

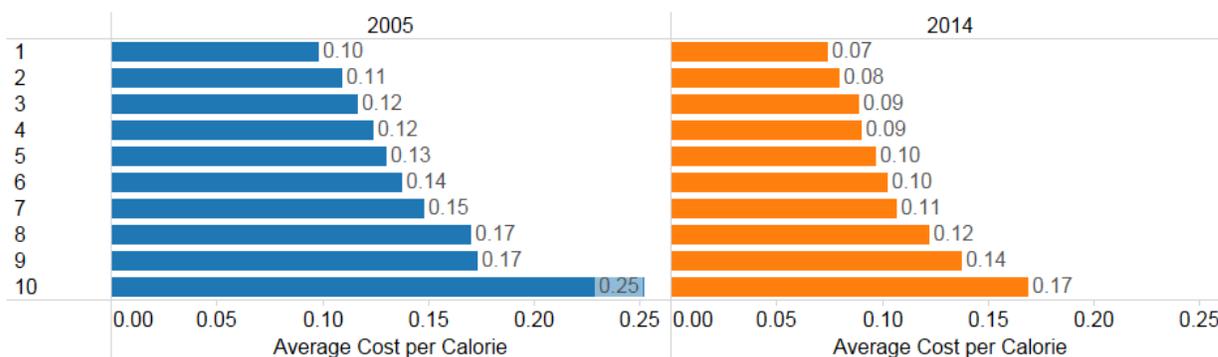
For the reasons described later in this sub-section and Annex II, this exercise deviates from the standard recommendation and use the 4<sup>th</sup> to 8<sup>th</sup> deciles as the reference group due to observed changes in food consumption patterns between the two rounds of the HBS. Although the two surveys are not necessarily comparable due to changes in instruments,<sup>64</sup> a comparison between 2005/6 and 2014 demonstrates a very revealing picture of the way food consumption patterns may have changed.

<sup>64</sup> For example, the diaries in 2014 lasted for 14 days, in contrast to 28 days in 2005. Second, the 2014 HBS has separate modules on purchases and consumption, while the 2005/6 HBS had a single module to collect data on both. Third, the 2014 diaries requires respondents to record purchases and consumption of food items every day while the 2005/6 questionnaire resembles repeated recalls in that it asked for weekly total expenditure and quantities by items, repeated for four times. Finally, the consumption module in 2014 is much more flexible in that

While the average caloric intake does not significantly vary between the two years, the average cost per calorie is almost 35 percent higher in 2005/6 than in 2014 (0.15 Riyals per calorie in 2005/6 versus 0.11 Riyals per calorie in 2014)<sup>65</sup> and it is consistently lower in 2014 than in 2005/6 across all consumption deciles except for the top decile (Figure 5.3). Moreover, the average cost per calorie between the 2<sup>nd</sup> and 4<sup>th</sup> deciles in 2014 is lower than that of the 1<sup>st</sup> decile in 2005/6. Thus using the 2<sup>nd</sup> to 4<sup>th</sup> deciles as the reference group following the standard practice in the literature results in too low a threshold to define poverty in Yemen in 2014 because even the poorest 10 percent in 2005/6 had a higher cost per calorie.

The reference group of the 4<sup>th</sup> to 8<sup>th</sup> deciles were selected because their average cost per calorie roughly corresponds to that of the bottom 34 percent in 2005/6, where 34 percent was the percent of the population deemed poor in 2005/6 under the old methodology.<sup>66</sup> This is an attempt to keep consistency between two incomparable methodologies by using the bottom 34 percent in 2005/6 as a benchmark to choose the reference group in 2014 under the CBN method. Using this reference group, the food poverty line was estimated 83,843 Riyals per person per year in 2014 prices.

Figure 5.3: Average cost per calorie by consumption deciles (2014 prices)



Source: World Bank staff calculations using the HBS 2005/06 and HBS 2014.

### Nonfood allowance

The last step in setting poverty lines under the CBN is to estimate nonfood allowance. While satisfying basic caloric needs precedes any other needs to maintain physical functions of the human body, one can argue that some basic nonfood goods and services, such as shelter, clothing and health care, are also necessary to stay out of poverty (Ravallion 1998). Ravallion (1998) proposes two alternative approaches to define the nonfood component of the poverty line by setting a lower bound and an upper bound. In this exercise, the upper bound approach is adopted because the resulting poverty headcount rate is known to be robust to the way consumption aggregate is defined (Lanjouw and Lanjouw 2003).

quantities consumed can be reported in one of 11 units for all items, whereas in 2005/6 the unit of measurement was predetermined by items.

<sup>65</sup> The comparison is real in that the cost in 2005/6 is expressed in 2014 price, adjusted by the food CPI provided by the CSO.

<sup>66</sup> The food poverty line in 2005/6 was calibrated using the bottom 40 percent as reference.

The following steps are used to estimate the upper bound of nonfood allowance:

- Estimate an average budget share of food items in total consumption for a reference group, where the reference is those whose food consumption is within one percent of the food poverty line.
- Repeat the above process for 9 additional times by increasing the range from which the reference is selected by an increment of one percent.
- Take the average of the average food share estimated over 10 iterations. This implicitly places more weights to those whose food consumption is closer to the food poverty line as they will be included in the reference more often.
- Obtain the total poverty line by dividing the food poverty line by the average food share obtained in the previous step. Since the food share ranges from 0 to 1, the total poverty line will always be greater than (or at least be equal to) the food poverty line. And the degree to which the total poverty line is greater than the food poverty line is determined by the average food share among the reference population.

In the current exercise, the average food share after 10 iterations was 51.6 percent. The total poverty line was estimated 162,528 Riyals per person per year.<sup>67</sup>

## Poverty Analysis

The final step is to estimate poverty and inequality statistics using the consumption aggregate and the total poverty line. To summarize the discussion so far, a consumption aggregate is constructed from various components: food consumption, nonfood consumption (education, durable goods, housing and other nonfood items and services). It is then adjusted for spatial price variations by the Paasche index. The total poverty line of 162,528 Riyals per person per year was estimated using the Cost of Basic Needs approach.

The poverty estimates are summarized in Table 5.5. The national poverty rate in 2014 is estimated to be 48.6 percent. Rural poverty rate is 59 percent, significantly higher than urban poverty rate of 24 percent. In all likelihood, all of these estimates indicate a significant increase from 2005/6. The 2005/6 poverty rates are estimated by deflating the total poverty line to the 2005/6 prices by the CPI and applying that line to the 2005/6 consumption aggregate compiled using the methodology described in Consumption Aggregate section whenever possible. In our best approximation, national poverty rate in 2005/6 is 35.4 percent and urban and rural rates are 17.5 percent and 42 percent, respectively. While questions remain regarding comparability of consumption data due to changes in the survey instruments as described in footnote 64, it is highly unlikely that changes in the questionnaire can singlehandedly alter national poverty rate by as much as 13 percentage points. Increased poverty incidence in 2014 is also consistent with the fact that the average cost per calorie has declined across the entire spectrum of the consumption distribution except for the top 10 percent as shown in Figure 5.3.

Table 5.5 also provides governorate-level poverty rates but results should be interpreted with caution due to larger margin of errors as evident in the confidence intervals.

---

<sup>67</sup> 83,843 Riyals divided by 0.516

Table 5.5: Poverty Headcount Rate by National, Urban/Rural and Governorate using 2014 HBS

	Poverty Headcount Rate	95% Confidence Interval	
		Lower bound	Upper bound
National	48.6%	46.5%	50.7%
Urban	23.9%	21.9%	26.0%
Rural	59.2%	56.3%	62.1%
Ibb	56.6%	49.6%	63.5%
Abyan	48.6%	34.1%	63.1%
Sanaa Ciry	13.4%	10.5%	16.2%
Al-Baida	39.2%	28.4%	49.9%
Taiz	41.4%	33.4%	49.4%
Al-Jawf	55.4%	41.4%	69.4%
Hajja	63.9%	54.1%	73.6%
Al-Hodei	58.1%	52.5%	63.7%
Hadramou	60.6%	50.5%	70.7%
Dhamar	31.1%	22.8%	39.3%
Shabwah	42.1%	28.6%	55.6%
Saadah	84.5%	78.1%	90.9%
Sanaa Region	42.1%	29.7%	54.5%
Aden	22.2%	16.4%	28.1%
Laheg	69.1%	61.7%	76.5%
Mareb	25.9%	11.8%	39.9%
Al-Mahwe	60.7%	50.8%	70.6%
Al-Mahar	57.8%	43.0%	72.6%
Amran	75.9%	66.1%	85.6%
Al-Dhale	59.8%	50.1%	69.6%
Remah	50.7%	39.9%	61.5%
Socatra	50.1%	34.4%	65.8%

Source: World Bank staff calculations using the HBS 2014.

## References

- Amendola, N., and G. Vecchi. 2014. "Durable goods and poverty measurement." *World Bank Policy Research Working ...* 7105(November). Available at: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2524159](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2524159) [Accessed March 16, 2015].
- Balcazar, C.F., L. Ceriani, S. Olivieri, and M. Ranzani. 2014. "Rent Imputation for Welfare Measurement: A Review of Methodologies and Empirical Findings." *World Bank Policy Research Working Paper* 7103.
- Deaton, A., and A. Tarozzi. 2000. "Prices and poverty in India." *Princeton, July*. Available at: [http://books.google.com/books?hl=en&lr=&id=3RvOfuqdGQ8C&oi=fnd&pg=PA12&dq=Prices+and+pove+rtty+in+India&ots=ZDWIZZUjdQ&sig=zeXpPi\\_B4CJaWq4uML2x74QDWDo](http://books.google.com/books?hl=en&lr=&id=3RvOfuqdGQ8C&oi=fnd&pg=PA12&dq=Prices+and+pove+rtty+in+India&ots=ZDWIZZUjdQ&sig=zeXpPi_B4CJaWq4uML2x74QDWDo) [Accessed January 5, 2015].
- Deaton, A., and S. Zaidi. 2002. "Guidelines for constructing consumption aggregates for welfare analysis." LSMS Working Paper No. 135,
- Gibson, J. 2007. "A guide to using prices in poverty analysis." Available at: [http://siteresources.worldbank.org/INTPA/Resources/429966-1092778639630/Prices\\_in\\_Poverty\\_Analysis\\_FINAL.pdf](http://siteresources.worldbank.org/INTPA/Resources/429966-1092778639630/Prices_in_Poverty_Analysis_FINAL.pdf).
- Government of Yemen, United Nations Development Program, and The World Bank. 2007. "Yemen Poverty Assessment: Volume II Annexes." Available at: <https://openknowledge.worldbank.org/handle/10986/7906>.
- Lanjouw, J.O., and P. Lanjouw. 2003. "How to compare apples and oranges: poverty measurement based on different definitions of consumption." *Review of Income and Wealth* (1):25–42. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/1475-4991.00002/abstract> [Accessed January 24, 2013].
- Ravallion, M. 1994. "Poverty comparisons." *Living Standards Measurement Study Working Paper* (88).
- Ravallion, M. 1998. "Poverty lines in theory and practice." *Living Standards Measurement Study Working Paper* (133).

## Annex

### Annex I: Sensitivity Analysis on Food Consumption and Implications of Outlier Treatment on Food Consumption Quantities

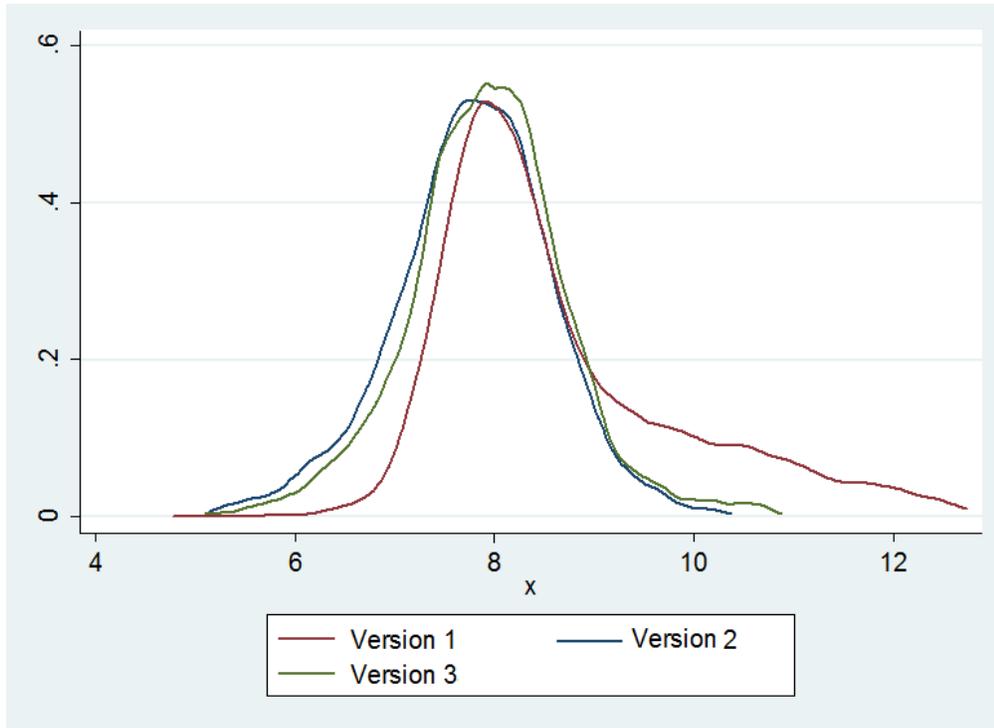
As discussed on Food Consumption in Consumption Aggregate section, the 2014 HBS has a unique questionnaire design in that food data are collected on two separate modules on purchases and consumption. This allows for flexibility in calculating food consumption. This annex compares three alternative options for calculating food consumption considered in this study and assesses implications of outlier treatment on food consumption quantities.

The part on Food Consumption explained that food consumption is obtained by multiplying quantities consumed in the consumption module with unit values from the purchase module. We refer to this Version 1. There are two other plausible options to obtain food consumption. One is to use expenditures and quantities from the purchase module (Version 2) but this will leave out self-produced food items and items received in-kind (See Table 5.1). Alternatively, a combination of Versions 1 and 2 can be used (Version 3) such that imputed food consumption on self-produced and in-kind items in Version 1 is added to Version 2.

Figure 1 compares distributions of the three alternative food consumption. First, it is evident that Version 3 is slightly larger than Version 2. By construction, adding to Version 2 the imputed expenditures on self-produced items and items received in-kind slightly increases the total food consumption in Version 3. Under these two approaches, however, the data in the food consumption module are entirely unutilized in the case of Version 2 and largely so in the case of Version 3. What stands out in the figure is the fat right tail in Version 1. Since Version 1 heavily utilizes quantities consumed in the food consumption module, the fat tail is indicative of some data issues in the food consumption module.

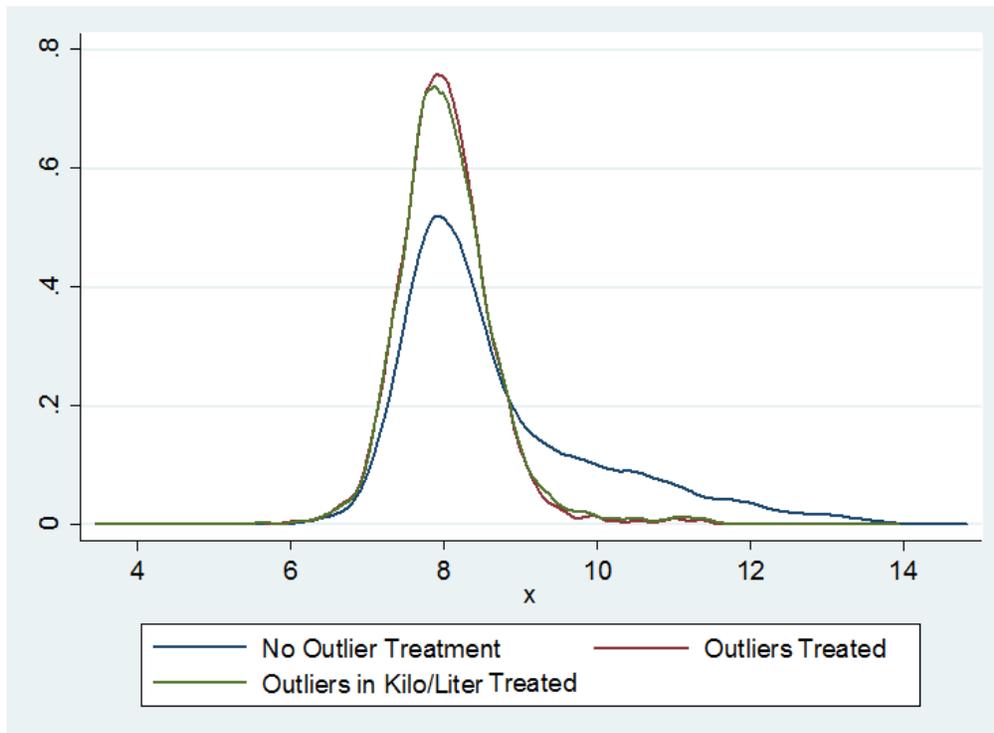
Figure 2 shows Version 2 food consumption with 1) no outlier treatment, 2) outliers replaced with the median values as described in Food consumption and 3) outliers whose quantities are recorded in kilos or liters are replaced with the median values (and the rest are untreated). Once outliers are treated, the fat right tail in the distribution almost disappears. The difference between treating all outliers and outliers recorded in kilos and liters are limited, indicating that the fat tail on the right in the original distribution can largely be attributed to outliers in quantities consumed in these two units of measurements where misreporting may be more likely to occur (e.g., kilograms versus grams and liters versus milliliters). Figure 3 modifies Figure 1 and shows Version 1 with outlier replacement.

Figure 5A.1: Kernel Density of Food Consumption (per capita, log, nominal)



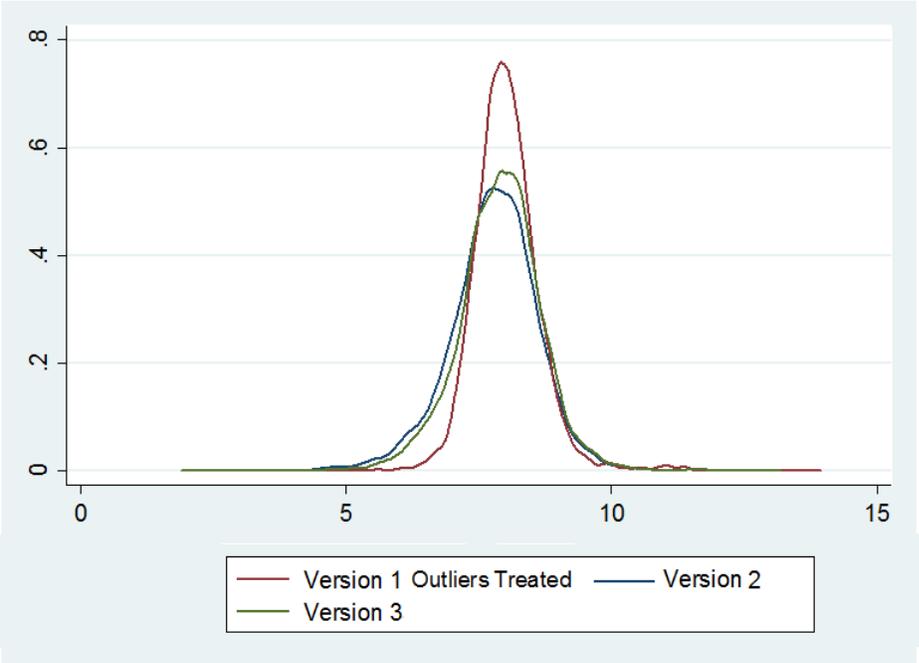
Source: World Bank staff calculations using HBS 2014

Figure 5A.2: Impact of Outliers on Food Consumption (Version 2, per capita, log, nominal)



Source: World Bank staff calculations using HBS 2014

Figure 5A.3: Kernel Density of Food Consumption (outliers treated, per capita, log, nominal)



Source: World Bank staff calculations using HBS 2014

## Annex II: Sensitivity Analysis on Poverty Lines and Poverty Rates

As discussed in Poverty Analysis, the national poverty rate in 2014 is estimated to be 48.6 percent. The earlier phase of this exercise, however, indicated a much lower level of poverty incidence. This annex summarizes a set of alternative scenarios for estimating poverty lines and poverty estimates in order to examine sensitivity of the final poverty estimates to the set of assumptions employed.

As briefly discussed in the Reference Population on Poverty Lines section, a standard practice in setting food poverty line is to use a relatively poor segment of the population as a reference group to estimate the cost of the food basket to satisfy minimum caloric threshold. However, simply following this approach and using the 2<sup>nd</sup> to 4<sup>th</sup> deciles of the consumption distribution as a reference group results in the overall poverty incidence of 35 percent in 2014. By deflating the underlying poverty line to the 2005/6 prices by monthly Consumer Price Index and applying it to the 2005/6 consumption aggregate that follows the same procedures as described in this report where possible, national poverty rate in 2005/6 would have been as low as 24 percent, which is significantly lower than 34 percent estimate in 2005/6.

As noted repeatedly, the CBN method is not comparable to the previous methodology of household specific poverty lines and thus direct comparison should be done with caution. But the two methodologies are similar in the estimation of the food poverty line and the major differences are only in the way nonfood allowance is estimated. As such, it was inconceivable that poverty incidence in Yemen in 2005/6 would have been lower by as much as 10 percentage points when both estimates are derived from the same caloric threshold of 2,200 calories.

A further investigation revealed that cost per calorie, which is the basis of the food poverty line estimation, became lower in 2014 relative to 2005/6 for all consumption deciles except for the top decile (Figure 5.3). The final poverty estimate of 48.6 percent in 2014 presented in Poverty Analysis section therefore modifies the reference group for the food poverty line estimation and uses the 4<sup>th</sup> to 8<sup>th</sup> deciles instead of the 2<sup>nd</sup> to 4<sup>th</sup> deciles such that the average cost per calorie in the reference group in 2014 is similar to the average cost per calorie of those who were deemed poor in 2005/6.

In an attempt to understand the implications on poverty estimates due to the methodological differences between the household specific poverty line approach and the CBN, the CBN approach is implemented using the 2005/6 data. In doing so, the bottom 34.8 percent is used as a reference group to estimate the food poverty line and the upper bound approach to account for nonfood allowance. The resulting national poverty rate in 2005/6 turned out to be approximately 34 percent, remarkably close to the existing estimate of 34.8 percent under the old methodology.

The fact that the two methodologies have little impact on the final poverty estimate at the national level in 2005/6 points to two important lessons in this exercise. First, the very low national poverty rate of 24 percent in 2005/6 discussed above is not because of the change in methodologies but because of different benchmarks to define poverty; the average cost per calories among the 2<sup>nd</sup> to 4<sup>th</sup> deciles in 2014 was too low a threshold to define poverty. Second, if the two methodologies result in similar poverty estimates, it is all the more sensible to adopt the CBN because of the practical limitations in the household specific poverty line method as explained in footnote 63. In particular, per capita consumption adjusted for spatial price differences can be directly used to estimate inequality statistics and to compare well-being across households in all locations.

As a robustness check, national poverty rate in 2014 is estimated by inflation-adjusting the 2005/6 poverty line based on the CBN 2014 prices. The resulting poverty rate is 49 percent, again very close to the final estimate of 48.6 percent when the 2014 CBN poverty line is used. An important takeaway is that in all iterations discussed here demonstrate a sizeable increase in poverty incidence between 2005/6 and 2014. While changes in survey instruments between the 2005/6 and 2014 HBSs make it challenging to compare poverty across time as explained in footnote 64, all available evidence suggests considerably worsening welfare status of Yemeni citizens between 2005/6 and 2014.